AD-A157 430 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 1/1
SITE 1 - BASIN BROOK.. (U) CORPS OF ENGINEERS WALTHAM MA
NEW ENGLAND DIV FEB 80

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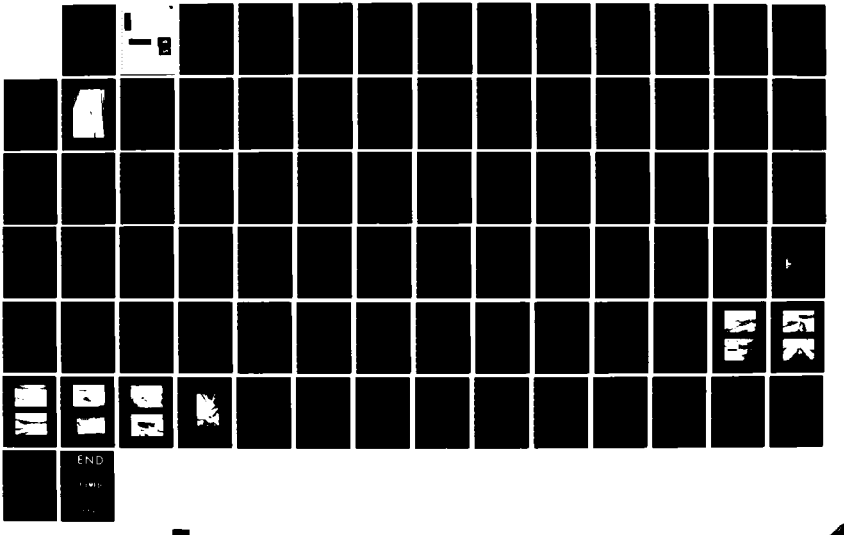

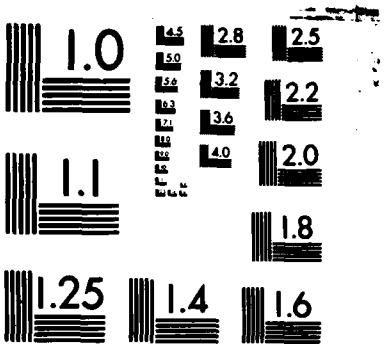


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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NH 00479	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Site 1- Basin Brook Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE February 1980 13. NUMBER OF PAGES 53
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

DAMS, INSPECTION, DAM SAFETY,

Saco River Basin
Chatham, New Hampshire
Basin Brook-tributary to Cold River

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

THe dam consists of a zoned earth embankment with an excavated emergency spillwayway on the right side. It is about 1080 ft. long with a hydraulic height of 43 ft. It is intermediate in size with a high hazard potential. The dam is in good condition. There was no evidence of settlement, lateral movement, or other signs of structural failure or other conditions which would warrent urgent remedial action. There are various remedial measures which should be implemented by the owner.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF
NEDED

JUL 22 1980

Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Gallen:

Inclosed is a copy of the Site 1 - Basin Brook Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Water Resources Board, the cooperating agency for the State of New Hampshire.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Water Resources Board for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

SACO RIVER BASIN
CHATHAM, NEW HAMPSHIRE

SITE 1 - BASIN BROOK DAM
NH 00479

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

FEBRUARY 1980

NATIONAL DAM INSPECTION PROGRAM
PHASE I INVESTIGATION REPORT

Identification No.:	NH 00479
Name of Dam:	Site 1 - Basin Brook
Town:	Chatham
County and State:	Carroll, New Hampshire
Stream:	Basin Brook tributary to Cold River
Date of Site Visit:	31 October 1979

BRIEF ASSESSMENT

Site 1 - Basin Brook Dam consists of a zoned earth embankment with an excavated emergency spillway on the right side. The dam has a curved alignment and is approximately 1,080 ft. long, overall, with a hydraulic height of 43 ft. The dam was built in 1969 as a Public Law 566 flood control structure. Recreational facilities were also incorporated with the development of the site.

Due to the extent of downstream development that would be affected in the event the dam were to fail, Site 1 - Basin Brook Dam is confirmed as having a "high" hazard potential in accordance with Corps of Engineers guidelines.

The dam is in good condition, based on a visual examination of the structure. There was no evidence of settlement, lateral movement or other signs of structural failure, or other conditions which would warrant urgent remedial action.

Based on the "intermediate" size and "high" hazard potential classifications, in accordance with Corps of Engineers guidelines, the test flood for this dam is the Probable Maximum Flood (PMF). With the water level at the top of dam, the total spillway capacity is approximately 8,000 cfs. Hydraulic analyses indicate that the test flood outflow of 4,600 cfs (inflow 7,200 cfs or 2,400 csm) can be passed with a freeboard of about 1.8 ft. and with an unused surcharge-storage of about 170 acre-ft. remaining.

The State of New Hampshire Water Resources Board, owner of the dam, should implement several remedial measures, including placing fill at the upstream toe of the earth embankment where erosion has occurred and monitoring flow from the blanket drain outlets, as outlined in Section 7.3. This work should be implemented by the Owner within two years after receipt of this report. The Owner should also prepare

a formal operations and maintenance manual for the dam and establish an emergency preparedness plan and downstream warning system that would compliment the State's existing disaster operations plan, "Link-Up".

HALEY & ALDRICH, INC.
by:

Harl Aldrich
President

This Phase I Inspection Report on Site 1 - Basin Brook Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the office of Chief of Engineers, Washington, DC 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I Investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the test flood is based on the estimated "probable maximum flood" for the region (greatest reasonably possible storm run-off), or a fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential. Consideration of downstream flooding other than in the event of a dam failure is beyond the scope of this investigation.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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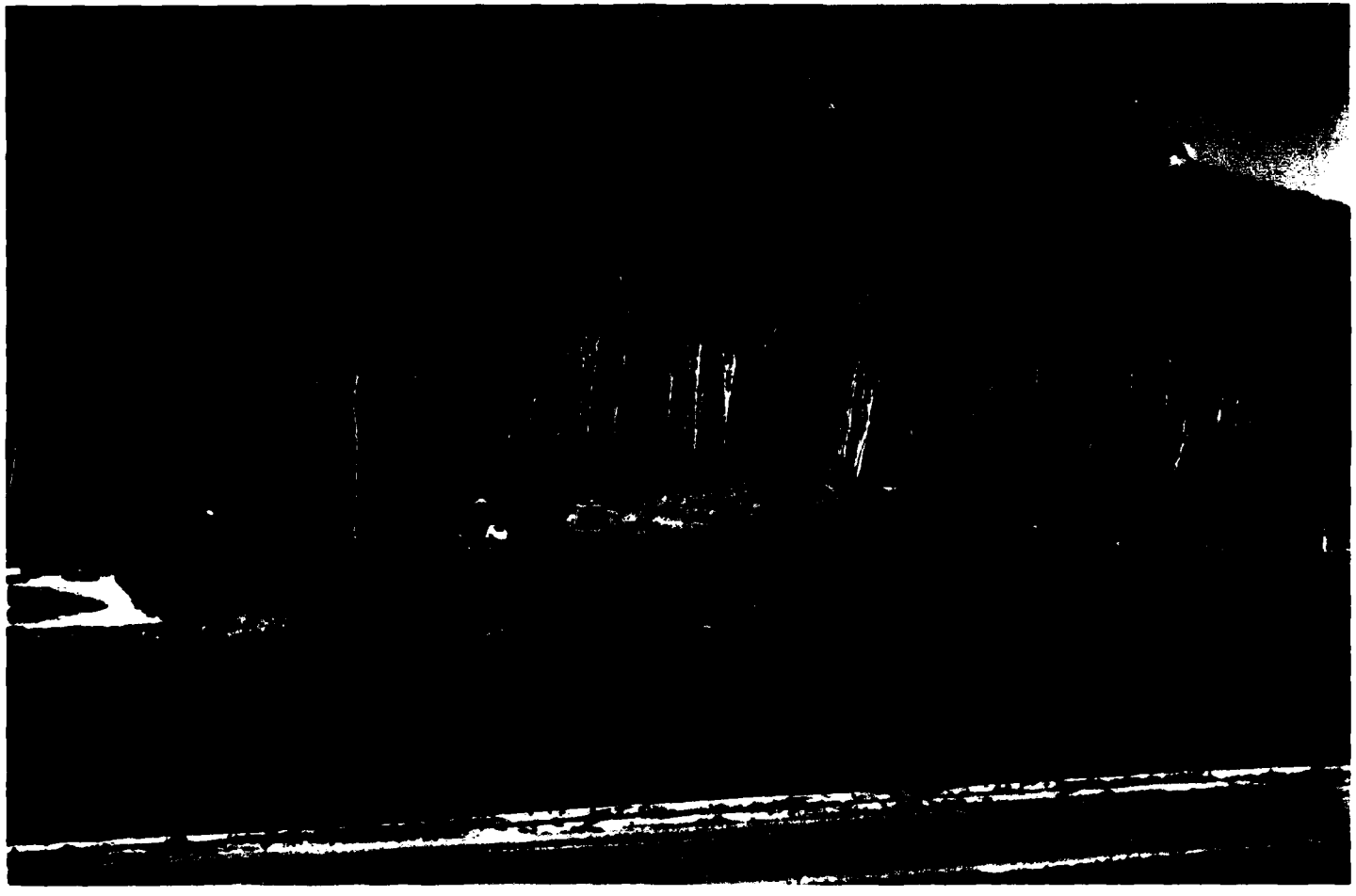
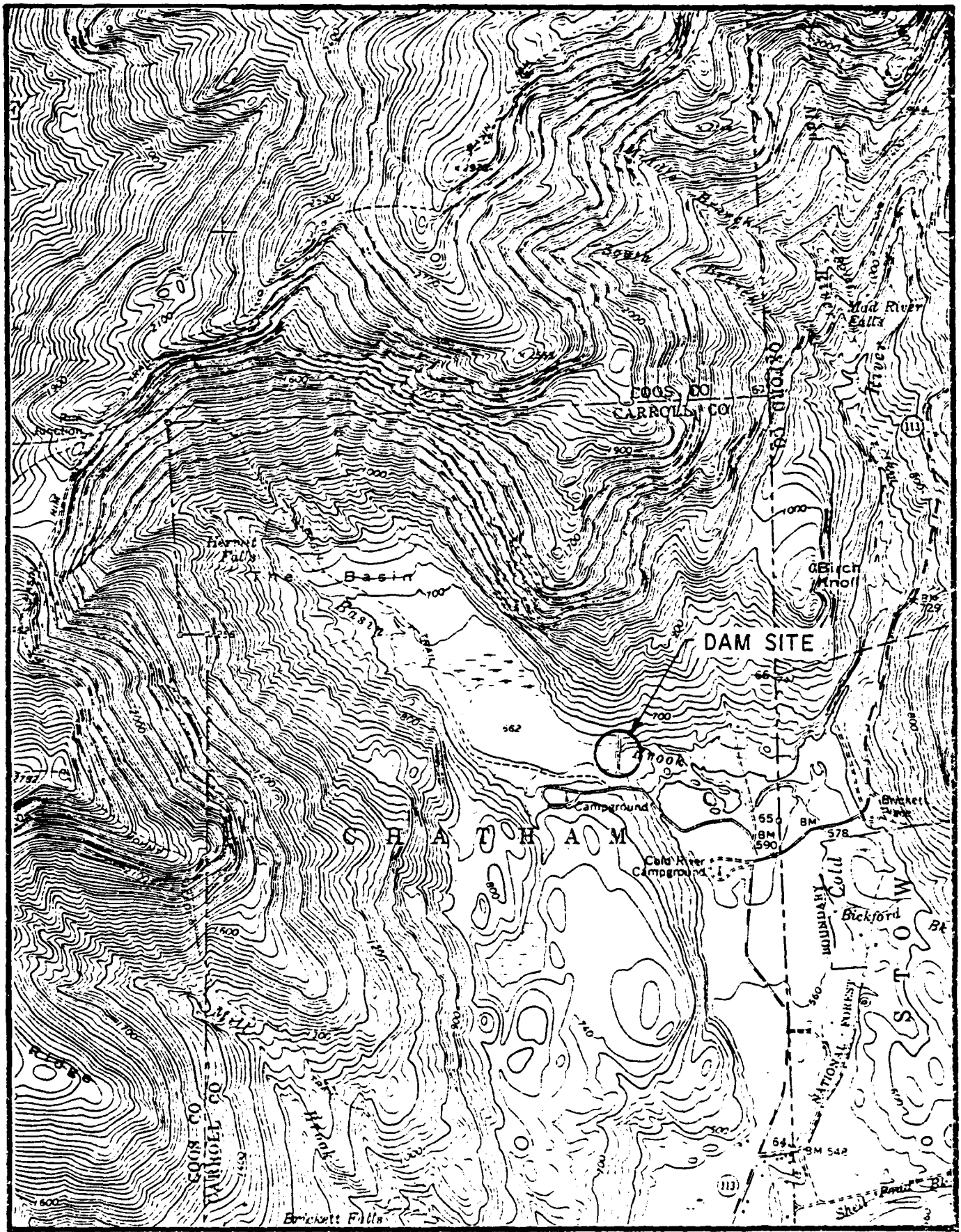


1. Overview of Site 1 - Basin Brook Dam from right side of dam



DAM: Site 1 - Basin Brook

IDENTIFICATION NO. NH 00479

LOCATION MAP

U.S.G.S. QUADRANGLE

WILD RIVER, NH-ME

APPROX. SCALE: 1" = 2000'

FILE NO. 4454 A16

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SITE 1 - BASIN BROOK DAM
NH 00479

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region.

Haley & Aldrich, Inc. has been retained by the New England Division to inspect and report on selected dams in the States of New Hampshire and Maine. Authorization and notice to proceed were issued to Haley & Aldrich, Inc. under a letter dated 31 October 1979 from Colonel William E. Hodgson, Jr., Corps of Engineers. Contract No. DACW33-80-C-0009 has been assigned by the Corps of Engineers for this work. Camp, Dresser & McKee, Inc. was retained as consultant to Haley & Aldrich, Inc. on the structural, mechanical/electrical and hydraulic/hydrologic aspects of the Investigation.

b. Purpose of Inspection. The primary purposes of the National Dam Inspection Program are to:

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

2. Encourage and prepare the states to initiate effective dam safety programs for non-Federal dams.

3. Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. The dam is located at the eastern end of the reservoir it forms as shown on the Location Map, page vii. The center of North Chatham, New Hampshire is approximately two miles south of the dam site. The

latitude and longitude of the dam site are N44°16.2' and W71°01.2'. Flow from the dam is conveyed easterly by Basin Brook into Maine where it joins the Cold River approximately 4,000 ft. downstream of the dam.

b. Description of Dam and Appurtenances. Site 1 - Basin Brook Dam consists of a zoned earth embankment with an excavated and revegetated emergency spillway on the right side. The earth embankment has a curved alignment and is approximately 740 ft. long with a hydraulic height of 43 ft. The emergency spillway has a crest length of about 225 ft. and is in a side channel configuration to direct flow around the right end of the embankment. The overall centerline length of the dam, embankment plus emergency spillway, is about 1,080 ft.

The embankment crest is unpaved and about 16 ft. wide. Side slopes, both upstream and downstream, are 3 horizontal to 1 vertical. The left end of the embankment terminates against a rising bedrock surface. On the right, the end of the embankment forms the left side of the emergency spillway. Positive cutoff from the bottom of the embankment to the underlying bedrock is provided by a trench filled with compacted glacial till.

Normal runoff flow is carried by the principal spillway, which is a drop inlet closed conduit structure consisting of a two-stage reinforced concrete riser. The riser portion of the principal spillway is located within the reservoir on the upstream slope at about the middle of the dam, close to the prior alignment of Basin Brook. The riser connects to a 36-in. diameter reinforced concrete pipe which conducts flow through the dam and outlets into a riprapped plunge pool. A reservoir drain has been incorporated with the principal spillway.

An internal blanket drain has been provided and consists of a trench filled with clean gravelly soils connected to two 9-in. nominal diameter asphalt coated corrugated metal pipes. Seepage is conducted by the two pipes to the plunge pool where they outlet, one on either side of the principal spillway outlet.

A boat ramp and paved parking lot form the approach to the emergency spillway. The parking lot connects to the site access roadway.

c. Size Classification. The storage to the top of Site 1 - Basin Brook Dam is estimated to be 1,360 acre-ft.,

and the corresponding hydraulic height of the dam is approximately 43 ft. Storage of from 1,000 to 50,000 acre-ft. and/or a height of from 40 to 100 ft. classifies a dam in the "intermediate" size category, according to the guidelines established by the Corps of Engineers.

d. Hazard Classification. The dam is currently classified as having a "high" hazard potential in the Corps of Engineers National Inventory of Dams. Dam failure analysis computations in Appendix D, which are based on "Guidance for Estimating Downstream Dam Failure Hydrographs", confirm this classification. A failure of Site 1 - Basin Brook Dam would result in the destruction of approximately 8 to 10 homes and cottages located about 1.7 mi. downstream of the dam. Potential loss of life is more than a few.

e. Ownership. The name, address and phone number of the current owner of Site 1 - Basin Brook Dam are:

Water Resources Board
State of New Hampshire
37 Pleasant Street
Concord, New Hampshire 03301
Phone: (603) 271-3406

Mr. Vernon A. Knowlton is the Chief Engineer of the Water Resources Board.

f. Operator. The Water Resources Board of the State of New Hampshire has been responsible for operation, maintenance and safety of the dam since it was built in 1969. The Board may be reached at the address and phone number listed above. The Water Resources Board does not designate a particular individual as operator of a specific dam but operates all state-owned dams by their staff of engineers and operators on a continual basis.

g. Purpose of Dam, Site 1 - Basin Brook Dam was built for watershed protection, flood prevention and recreation.

h. Design and Construction History. The dam was designed by the Soil Conservation Service of the U.S. Department of Agriculture in conjunction with the Carroll County Conservation District, New Hampshire Water Resources Board and U.S. Forest Service. The dam, associated appurtenant structures and recreational facilities were constructed by the Robie Construction Company, Inc. of Manchester, New Hampshire, in 1969. Records of the dam's design and construction history, including contract documents and as-built drawings are available through the Soil Conservation Service office in Durham, New Hampshire.

i. Normal Operational Procedures. Site 1 - Basin Brook Dam is a self-regulating facility with no flashboards, stoplogs or gated outlets other than the reservoir drain. The operational procedures, therefore, are confined to inspecting the principal spillway inlets to insure that they are clear of debris.

1.3 Pertinent Data

All elevations reported herein are based on or were measured relative to elevations appearing on as-built drawings of the dam. Based on a comparison with information given on the USGS Wild River Quadrangle Map, it appears reasonable to assume that the elevations on the drawings are based on National Geodetic Vertical Datum (NGVD).

a. Drainage Area. The drainage area tributary to the dam site is 3.0 sq. mi. The watershed is completely undeveloped heavily forested mountainous terrain. With reservoir at top of dam, the water surface area accounts for approximately 5 percent of the total drainage area.

b. Discharge at Dam Site

1. Outlet works (24-in. diameter reservoir drain at invert El. 646.5)	90 cfs with reservoir level at principal spillway orifice invert El. 661.5
2. Maximum known flood at dam site	Unknown
3. Ungated principal spillway capacity at crest of emergency spillway	185 cfs at El. 675.5
4. Ungated principal spillway capacity at crest of riser	60 cfs at El. 670.5
5. Gated spillway capacity at normal pool elevation	Not applicable
6. Gated spillway capacity at test flood pool elevation	Not applicable
7. Total project capacity at top of dam	8,000 cfs at El. 681.5
8. Total project discharge at test flood pool elevation	4,600 cfs at El. 679.7

c. Elevation (ft. above NGVD)

1. Streambed at centerline of dam	638.5

2. Maximum tailwater..... Unknown
3. Upstream portal invert diversion tunnel..... Not applicable
4. Recreation pool..... 661.5
5. Full flood control pool..... 675.5
6. Spillway crest
   Invert of principal spillway orifices..... 661.5
   Crest of principal spillway weirs..... 670.5
   Crest of emergency spillway.. 675.5
7. Design surcharge - original design..... 681.3
8. Top of dam..... 681.5
9. Test flood surcharge..... 679.7

d. Length of Reservoir (mi. estimated)

1. Maximum pool..... 0.80
2. Recreation pool..... 0.44
3. Flood control pool..... 0.76

e. Storage (acre-ft.)

1. Recreation pool..... 110
2. Flood control pool..... 847
3. Spillway crest
   Invert of principal spillway orifices..... 110
   Crest of principal spillway weirs..... 527
   Crest of emergency spillway.. 847
4. Top of dam..... 1,360
5. Test flood pool..... 1,190

f. Reservoir Surface (acres)

1. Recreation pool..... 28.5
2. Flood control pool..... 73.0
3. Spillway crest
   Invert of principal spillway orifices..... 28.5
   Crest of principal spillway weirs..... 59.0
   Crest of emergency spillway.. 73.0
4. Top of dam..... 94.0
5. Test flood pool..... 87.7

g. Dam

1. Type..... Earth embankment

2. Centerline length.....	1,080 ft. including emergency spillway
3. Height.....	43 ft.
4. Top width of embankment.....	16 ft.
5. Side slopes.....	3H to 1V both U/S and D/S
6. Zoning.....	Zone I - Embankment core and cutoff trench - very dense glacial till Zone II - D/S and U/S shells - dense gravelly soil Zone III - Blanket drain - dense clean gravelly soil
7. Impervious core.....	Compacted glacial till
8. Cutoff.....	Cutoff trench backfilled with compacted glacial till
9. Grout curtain.....	None
10. Other.....	Toe drains below downstream slope are asphalt coated corrugated metal pipe

h. Diversion and Regulating Tunnel. Not applicable

i. Spillway

1. Type.....	Principal spillway: two stage drop inlet. Emergency spillway: earth cut
2. Length of weir	
Principal spillway orifices (two, each 27 in. x 11-3/8 in.).....	4.5 ft.
Principal spillway weirs (two, each 9 ft. long).....	18.0 ft.
Emergency spillway.....	225.0 ft.
3. Crest elevation	
Invert of principal spillway orifices.....	661.5
Crest of principal spillway weirs.....	670.5
Crest of emergency spillway..	675.5
4. Gates.....	None
5. U/S channel.....	Basin Brook Reservoir
6. D/S channel.....	Basin Brook from principal spillway plunge pool; 0.04 ft./ft. exit slope from emergency spillway

7. General..... 36-in. diameter conduit through dam to plunge pool at toe of dam

j. Regulating Outlets. The reservoir drain consists of a 24-in. diameter intake pipe at invert elevation 646.5 which extends approximately 32 ft. from the reservoir to the principal spillway structure where it is gated (see Appendix page B-18). An ungated 216-ft. long, 36-in. diameter conduit conveys discharge from the principal spillway intake, through the dam, to a plunge pool at the downstream toe of the dam. A manual gate operator for the reservoir drain is located on the top of the principal spillway intake.

SECTION 2 - ENGINEERING DATA

2.1 Design Data

Site 1 - Basin Brook Dam was designed as an earth embankment flood control structure under Public Law 566. In particular, the facility was designed to retard a 100-yr. frequency storm without discharge occurring over an earth cut emergency spillway.

The earth embankment was designed in zones delineated by the three general soil types used to construct it. The primary portion of the dam embankment is a large impervious core of glacial till excavated at the site to form the emergency spillway. This same glacial till was used to construct a cut off trench below the embankment. Upstream and downstream shells are made up of a relatively pervious gravelly soil. A blanket drain of highly pervious clean gravelly soil was designed to control the phreatic surface on the downstream side.

The original Design Report and Contract Specifications prepared by the Soil Conservation Service, Engineering & Watershed Planning Unit in Upper Darby, Pennsylvania, constitutes the available design data. The design report outlines the procedures used in the hydraulic/hydrologic, foundation and embankment designs. The Design Report and Contract Specifications may be viewed at the Soil Conservation Service office in Durham, New Hampshire, telephone (603) 868-7581. Mr. Tillman Marshall is State Conservation Engineer with the Soil Conservation Service in Durham.

2.2 Construction Data

The Robie Construction Company, Inc. of Manchester, New Hampshire, completed construction of the dam in 1969. Construction operations were monitored by the Soil Conservation Service and copies of related correspondence, as-built drawings and field log books are on file at their Durham, New Hampshire, office. Records of costs have been kept by the Robie Construction Company.

2.3 Operation Data

Operational data in the form of prior inspection reports and correspondence documenting the performance of maintenance and remedial work were located at the offices of the New Hampshire Water Resources Board.

2.4 Evaluation of Data

a. Availability. A list of the engineering data available for use in preparing this report is included on page B-1. Selected documents from this listing are also included in Appendix B.

b. Adequacy. There was a considerable amount of engineering data available to aid in the evaluation of Site 1 - Basin Brook Dam. A review of these data in combination with a visual examination, preliminary hydraulic and hydrologic computations, consideration of past performance and application of engineering judgement, was adequate for the purposes of a Phase I assessment.

c. Validity. The information contained in the engineering data may generally be considered valid.

SECTION 3 - VISUAL EXAMINATION

3.1 Findings

a. General. The Phase I visual examination of Site 1 - Basin Brook Dam was conducted on 31 October 1979. The upstream water surface elevation was about 0.7 ft. above the invert of the two principal spillway orifices that day.

In general, the project was found to be in good condition. Several minor deficiencies which require correction were noted. Although access was gained into the principal spillway, the operation of the reservoir drain was not demonstrated.

A visual inspection check list is included in Appendix A and selected photographs of the project are given in Appendix C. A "Site Plan Sketch", page C-1, shows the direction of view for each photograph.

b. Dam. The upstream slope of the dam's earth embankment is covered with moss, grass and weeds, the latter are up to 2 ft. in height, as shown on Photo No. 2. The vegetation poses no problem in walking across the slope, but does make it difficult to see the ground surface where it is thick. There is no riprap or erosion protection on the upstream slope other than the vegetation.

There has been minor erosion and sloughing at the toe of the upstream slope, between the principal spillway and the dam embankment, Photo No. 3. The erosion has cut into the toe of the slope at one point leaving a vertical bank approximately 12 to 15 in. high over a width of about 8 ft. Near the right end of the embankment, a small path about 6 in. deep and 2 ft. wide has been worn by foot traffic and rainfall. Overall, the upstream slope appears to be in good to excellent condition.

There is minor rutting along the unpaved crest of the embankment from vehicle traffic as shown on Photo No. 4. The crest is locally worn bare of vegetation, particularly near the middle of the embankment, Photo No. 5. The vertical alignment is curved as designed. Other than the minor rutting and bare spots, the embankment crest is in good shape.

The downstream slope is well vegetated, Photo No. 6, and does not seem to be deficient in any way. Conditions are excellent at both the left abutment and at the right end of the embankment adjacent to the emergency spillway.

The approach to the dam's emergency spillway, the paved parking area, is in good condition. The earth cut that forms the emergency spillway is well vegetated, Photo No. 7, and all slopes appear stable.

c. Appurtenant Structures. In general, the principal spillway is in good condition, Photo No. 8. The inlets were clear of obstructions and the bar racks were undamaged and intact with only minor surface rust. Although the gate operator for the reservoir drain was not tested, nothing was observed which would indicate potential difficulty in operating the gate. The interior ladder appeared to be in good condition, Photo No. 9.

In general, the conditions around the outlet of the 36-in. diameter reinforced concrete pipe and the riprap lined plunge pool were good, as shown on Photo No. 10. The outlet pipe and its support cradle are in good alignment, Photo No. 11. The structural condition is good, with only one minor crack apparent in the cradle.

The two corrugated metal pipe outlets for the blanket drain are asphalt-covered and located on either side of the principal spillway outlet pipe. The pipe on the left side was encrusted with about a 3-in. deposit of iron oxide materials, Photo No. 12. Flow from the right and left blanket drain outlets was measured at 1.6 gpm and 3.8 gpm, respectively. The water was clear.

d. Reservoir Area. Basin Brook Reservoir is bordered by undeveloped, heavily forested terrain with some marshland at the upper end of the reservoir. The terrain of the watershed is mountainous. The shoreline is totally undeveloped except for the paved parking lot which serves as the approach for the emergency spillway.

e. Downstream Channel. Basin Brook conveys discharge from the dam approximately 4,000 ft. through undeveloped terrain to its confluence with Cold River. About 400 ft. downstream of the confluence is the Route 113 roadway embankment and bridge. The average channel slope from the dam to Route 113 is about 0.018 ft./ft. The outlet channel appeared to be in good condition. Only minor displacement of riprap was noted on the left side of the plunge pool at the entrance to the brook. Minor brush is present on the right side of the brook just downstream of the plunge pool.

3.2 Evaluation

Based on the visual examination conducted on 31 October

1979, the earth embankment and appurtenant structures of Site 1 - Basin Brook Dam are considered to be in good condition. No condition was observed that would adversely affect the safety of this dam. The remedial measures outlined in Section 7.3 should be implemented to correct the noted erosion at the upstream toe of the embankment.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. In general, there are no procedures for the operation of the Site 1 - Basin Brook Dam in that the project is self-regulating with no facilities for flashboards, stoplogs or gated outlets other than the reservoir drain.

b. Description of any Warning System in Effect. There is no specific warning system or emergency preparedness plan in effect for this structure. However, the Owner is within the framework of the operations plan "Link-Up", an interagency plan in the State of New Hampshire for natural and man-made disaster operations. The plan establishes the procedure for notifying and calling upon the resources of other state agencies in times of emergency.

4.2 Maintenance Procedures

a. General. An inspection checklist prepared by the designer, U.S. Department of Agriculture, Soil Conservation Service, entitled "Maintenance Checklist for PL 566 Flood Control Structures", is used for annual inspection of the dam. While references indicate the dam was inspected in 1979 and the checklist completed, the last checklist furnished by the Owner was for the inspection on 19 June 1978. Maintenance is performed at the dam on a routine basis.

b. Operating Facilities. The emergency spillway appeared to be well maintained and free of debris. The reservoir drain gate operator appeared to be satisfactorily maintained although its operation was not demonstrated during the site visit. The outlet works plunge pool and discharge channel were free of debris.

4.3 Evaluation

Maintenance of the facility is based on conditions observed during the annual technical inspections. The annual technical inspections should be continued and formal written operational procedures and maintenance programs should be established.

Since a failure of the dam would probably cause loss of life and extensive property damage downstream, a detailed

emergency preparedness plan and warning system should be established for the specific dam to compliment the existing operations plan "Link-Up". Incorporated in the procedures should be a requirement to operate the reservoir drain periodically.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Site 1 - Basin Brook Dam forms a flood retarding/recreational reservoir located on the Basin Brook tributary of the Cold River. The project is basically a high surcharge-low spillage facility which was designed to retain a 100-yr. frequency storm without discharge occurring in the emergency spillway. The principal spillway is a drop inlet structure consisting of a reinforced concrete riser and reinforced concrete pipe which outlets into a rip-rapped plunge pool. The dimensions of the two orifices which maintain normal pool level are 27 in. x 11-3/8 in. each, and the length of the upper two weirs in the principal spillway are 9 ft. each. The crests of the weirs are 9 ft. above the invert of the orifices, and 5 ft. below the crest of the emergency spillway. The maximum surcharge height from normal pool to top of dam is 20 ft.

5.2 Design Data

The project's hydraulic/hydrologic design computations are available at the offices of the U.S. Department of Agriculture, Soil Conservation Service, Durham, New Hampshire. The following is a summary of pertinent data as it appears in the design report:

1. Watershed Data

A. Structure class	"c"
B. Drainage area	1,920 acres (3.0 sq. mi.)
C. Time of concentration - Tc	0.7 hrs.
D. Hydrologic curve number - Cn Moisture Condition II	70

2. Principal Spillway

A. Conduit	
1. Inside diameter	36 in.
2. Length	216 ft.
B. Riser	
1. Inside dimensions	3.0 x 9.0 ft.
2. Height (floor to crest)	28.0 ft.
C. Weir length	18.0 ft.
D. Orifice dimensions	27 x 11-3/8 in.
E. Reservoir drain size	24 in.
F. Type of energy dissipator	Plunge pool

3. Emergency Spillway

A. Width..... 225.0 ft.
B. Side slopes..... 4:1 and 3:1 ft./ft.
C. Length of level section..... 50 ft.
D. Exit slope..... 0.04 ft./ft.
E. Maximum velocity in exit section at D.H.W..... 3.9 ft./sec.
F. Duration of flow through emergency spillway at D.H.W.. 2 hrs.
G. Frequency of use..... 1 percent

5.3 Experience Data

There are no records of any major hydrological occurrances at the dam site since its construction in 1969.

5.4 Test Flood Analysis

Based on the Corps of Engineers Guidelines, the recommended test flood for the size "intermediate" and hazard potential "high" is the Probable Maximum Flood (PMF). The PMF was determined using the Corps of Engineers Guidelines for "Estimating Maximum Probable Discharge" in Phase I Dam Safety Investigations. The 3.0 sq. mi. drainage area consists of heavily forested, steeply sloped mountainous terrain. A peak inflow rate of 2,400 csm was selected for the PMF inflow rate resulting in a test flood inflow of 7,200 cfs.

Surcharge storage routing of the test flood inflow resulted in a routed test flood outflow of 4,600 cfs at a reservoir stage of about 1.7 ft. below top of dam. Since the facilities discharge capacity with reservoir at top of dam is 8,000 cfs, the project is hydraulically adequate to pass the test flood without overtopping the dam.

5.5 Dam Failure Analysis

Based on the Corps of Engineers Guidelines for estimating dam failure hydrographs, and assuming that a failure would occur along 40 percent of the mid-height length of the dam with reservoir level at top of dam, the peak failure outflow is estimated to be 66,400 cfs in addition to the 8,000 cfs project discharge occurring prior to failure. Since analysis indicates that the 8,000 cfs occurring prior to failure could potentially constitute a high hazard, a second dam failure was assumed with reservoir level at emergency spillway crest elevation. Under

this condition, the peak failure outflow is estimated to be 53,400 cfs in addition to the 210 cfs principal spillway discharge occurring prior to failure. Routing of the combined dam failure outflow downstream indicates that the Route 113 bridge, located about 4,000 ft. downstream of the dam, would be overtopped by about 6 ft. and that a wooden bridge, located approximately 5,000 ft. further downstream would also be overtopped by about 6 ft. Approximately 8 to 10 homes and/or cottages, located between the two bridges, would be subjected to a flood wave which would be about 6 ft. above their sill elevations.

The potential loss of life resulting from a dam failure is more than a few and the dam is accordingly classified in the "high" hazard category.

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

There was no visual evidence of settlement, lateral movement or other signs of structural instability in the earth embankment or principal spillway of Site 1 - Basin Brook Dam.

6.2 Design and Construction Data

Design plans and specifications for Site 1 - Basin Brook Dam were located. Geotechnical analyses were conducted by the Soil Conservation Service for both the upstream and downstream slopes; the results of which are presented in a Memorandum dated 1 March 1968 and included in Appendix B as pages B-3 through B-7. Also included in Appendix B is a summary of the design data for the dam and its associated hydrology, pages B-8 and B-9, respectively. Based on the visual examination conducted on 31 October 1979 and a review of the available information, the earth embankment is considered to be stable.

6.3 Post-Construction Changes

There have been no known modifications to the earth embankment, emergency spillway or principal spillway since the facility was constructed in 1969.

6.4 Seismic Stability

Site 1 - Basin Brook Dam is located in a Seismic Zone 2 and in accordance with Recommended Phase I Guidelines does not warrant seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual examination of Site 1 - Basin Brook Dam revealed that the structure was in good condition. There were no signs of impending structural failure or other conditions which would warrant urgent remedial action.

Based on the results of computations included in Appendix D and described in Section 5, the spillway is capable of passing the test flood, which for this structure is the PMF, without overtopping the dam. With the water level at the top of the dam, the total spillway capacity is approximately 8,000 cfs. The test flood outflow of 4,600 cfs (inflow of 7,200 cfs or 2,400 csm) can be passed with a freeboard of approximately 1.8 ft. and an unused surcharge-storage of 170 acre-ft. remaining.

b. Adequacy of Information. This evalution of the dam is based primarily on visual examination, approximate hydraulic and hydrologic computations, consideration of past performance and application of engineering judgement. The information available or obtained within the scope of this investigation was adequate for the purposes of a Phase I assessment.

c. Urgency. The recommendations for remedial measures outlined in Section 7.3 should be undertaken by the Owner and completed within two years after receipt of this report.

7.2 Recommendations

None

7.3 Remedial Measures

Although the dam is generally in excellent condition, it is considered important that the following items be accomplished.

a. Operation and Maintenance Procedures. The following should be undertaken by the Owner:

1. Place well-graded crushed stone fill at the toe of the upstream slope in the area experiencing erosion and sloughing. It is suggested, that due to the limited extent of the erosion, this work be done by manual means so that the slope is not subjected to heavy equipment traffic. The performance of the crushed stone fill should be monitored for evidence of any further erosion and/or sloughing. If the repair is observed not to be effective, the owner should then investigate the means of establishing erosion control in the failed area. This investigation should be conducted under the direction of a registered professional engineer.

2. Periodically, determine the rate of flow from the blanket drain outlets so that it may be correlated with reservoir water surface elevation, rainfall and other factors.

3. Operate the reservoir drain gate mechanism at the principal spillway to insure its operability. In addition, a procedure should be established to operate the reservoir drain gate mechanism periodically.

4. Continue with the present program of annual technical inspections performed in conjunction with the Soil Conservation Service.

5. Prepare an operations and maintenance manual for the specific dam. The procedures should delineate the routine operational procedures and maintenance work to be done on the dam to ensure safe, satisfactory operation and to minimize deterioration of the facility.

6. Develop a written emergency preparedness plan and warning system to be used in the event of impending failure of the dam or other emergency conditions. The plan should be developed in cooperation with local officials and downstream inhabitants and should compliment the State's existing disaster operations plan, "Link-Up".

The designer of the dam, the Soil Conservation Service, is in the process of developing an "Operation and Maintenance Handbook - Watershed Structures in New Hampshire". The completion of this handbook and its adoption by the Owner for this dam, along with supplementary information by the Owner,

may fulfill the need for an operations and maintenance manual and emergency preparedness plan.

7.4 Alternatives

None

APPENDIX A - INSPECTION CHECK LIST

VISUAL INSPECTION PARTY ORGANIZATION

NATIONAL DAM INSPECTION PROGRAM

Dam: Site 1 - Basin Brook

Date: 31 October 1979

Time: 1035 to 1215

Weather: Clear with cool temperatures (45°F)

Water Surface Elevation Upstream: 662.2 (NGVD) (0.7 ft. above the invert of the two orifice intakes)

Stream Flow: Unknown

Inspection Party:

Harl P. Aldrich, Jr. Charles R. Nickerson Haley & Aldrich, Inc.	-	Soils/Geology
Roger H. Wood	-	Structural/Mechanical
Joseph E. Downing Camp, Dresser & McKee, Inc.	-	Hydraulic/Hydrologic

Present During Inspection:

Kenneth T. Stern, State of New Hampshire Water Resources Board

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Site 1 - Basin Brook DATE: 31 Oct. 1979

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	El. 681.5
Current Pool Elevation	El. 662.2
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	No pavement; top of dam is grass covered with some bare areas. Shallow ruts from vehicle traffic present
Movement or Settlement of Crest	None observed
Lateral Movement	None observed
Vertical Alignment	Good
Horizontal Alignment	Curved, see Appendix page B-17
Condition at Abutment and at Concrete Structures	Satisfactory
Indications of Movement of Structural Items on Slopes	No structures on slopes other than principal spillway - See Outlet Works
Trespassing on Slopes	Unrestricted
Animal Burrows in Embankment	None observed
Vegetation on Embankment	Heavy growth of moss, grass and weeds; no brush or trees
Sloughing or Erosion of Slopes or Abutments	None except at upstream toe behind spillway intake structure (see Photo No. 3)
Rock Slope Protection - Riprap Failures	No riprap
Unusual Movement or Cracking at or near Toes	None observed
Unusual Embankment or Downstream Seepage	None observed
Piping or Boils	None observed
Foundation Drainage Features - Toe Drains	Toe drains evident. Two 9-in. diameter drains adjacent to 36-in. diameter outlet, 1.6 gal./min. out of right drain, 3.3 gal./min. out of left drain (Measured) The water was clear
Instrumentation Systems	None

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Site 1 - Basin Brook DATE: 31 Oct. 1979

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel and Riser	
Slope Conditions	Riser within pond
Bottom Conditions	Sandy gravel bottom with some cobbles
Rock Slides or Falls	None
Log Boom	None - inlets protected by heavy bar racks. Good condition but some rust present
Debris	No material debris observed
Condition of Concrete	Very good
Ladder	Good
Drains or Weep Holes	None observed
Spalling	None observed
Visible Reinforcing	None observed
Rusting or Staining of Concrete	None observed
Any Seepage or Efflorescence	None observed
Joint Alignment	Not applicable
Unusual Seepage or Leaks in Gate Chamber	None observed
Cracks	Local surface crazing
Rusting or Corrosion of Steel	None observed
b. Mechanical and Electrical	
Emergency Gates	Reservoir drain has manually operated gate. Handle kept in Concord, NH by NHWRB

FILE NO. 4454
HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Site 1 - Basin Brook DATE: 31 Oct. 1979

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Good (36 in. concrete pipe on concrete cradle)
Rust or Staining	None observed
Spalling	None observed
Erosion or Cavitation	None observed
Visible Reinforcing	None observed
Any Seepage or Efflorescence	Slight efflorescence at minor crack in cradle, right side
Condition at Joints	Good
Drain holes	Not applicable
Channel	Riprapped pool with discharge channel. Some riprap displacement at left side of pool at entrance to channel
Loose Rock or Trees Overhanging Channel	None observed
Condition of Discharge Channel	Good but brush on right side
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Very good
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	None observed
Floor of Approach Channel	Grassed slope to bit-conc. parking lot
b. Weir	
General Condition	Vegetated channel with included paved roadway. Grass has not been recently mowed. Side slopes are clear of trees but there are tall weeds present on the right side at the base of the slope

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Site 1 - Basin Brook DATE: 31 Oct. 1979

AREA EVALUATED	CONDITION
c. Discharge Channel	
General Condition	Normal (natural overland flow)
Loose Rock Overhanging Channel	Not applicable
Trees Overhanging Channel	Not applicable
Floor of Channel	Park access road and forested area

APPENDIX B - ENGINEERING DATA

LIST OF AVAILABLE DATA
SITE 1 - BASIN BROOK DAM

Document	Contents	Location
Lorn P. Dinnigan Memorandum to Charles H. Dingle	Report on Soil and Foundation Conditions dated 1 March 1968	United States Department of Argiculture Soil Conservation Service Durham, New Hampshire (See Appendix pages B-3 through B-7)
Contract Specifications	Construction bid documents for Site 1, Cold River-Old Course Saco Watershed dated September 1968	United States Department of Agriculture Soil Conservation Service
Design Report	Design folder for Basin Brook Dam, undated circa 1969	United States Department of Agriculture Soil Conservation Service (See Appendix pages B-8 and B-9)
Correspondence between New Hampshire Water Resources Board and Robie Construction Company	Correspondence during dam construction starting 28 January 1969	Water Resources Board State of New Hampshire 37 Pleasant Street Concord, New Hampshire 03301
Cold River-Old Course Saco Watershed Project Basin Brook Multiple Purpose Dam No. 1	As-built drawings, dated 1969	United States Department of Agriculture Soil Conservation Service
Richard B. Chamberlin Memorandum to Vernon A. Knowlton	Note on complaint and site visit dated 5 February 1973	Water Resources Board State of New Hampshire
New Hampshire Water Resources Board, Dam Safety Inspection Report Form	Two page inspection dated 12 October 1973	Water Resources Board State of New Hampshire (See Appendix pages B-10 and B-11)

LIST OF AVAILABLE DATA
SITE 1 - BASIN BROOK DAM
(continued)

Document	Contents	Location
Gary L. Kerr letter to James Haine	Correspondence on maintenance work done on dam in 1976	Water Resources Board State of New Hampshire
Maintenance Checklist for PL 566 Flood Control Structures and associated correspondence	Five items relating to inspection dated 19 June 1978	Water Resources Board State of New Hampshire (See Appendix pages B-12 through B-16)
C.H. Dingle letter to Vernon Knowlton	Correspondence on and reference to O & M Inspection Report, dated 14 August 1979	Water Resources Board State of New Hampshire

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Charles H. Dingle, State Conservation Engineer, SCS, Durham, New Hampshire

DATE: March 1, 1968

FROM : Lorn P. Dunnigan, Head, Soil Mechanics Laboratory, SCS, Lincoln, Nebraska

SUBJECT: ENG 22-5, New Hampshire WP-08, Cold River Watershed Project, Basin Brook Multiple Purpose Dam, Site No. 1

ATTACHMENTS

1. Form SCS-354, Soil Mechanics Laboratory Data, 3 sheets.
2. Form SCS-355, Triaxial Shear Test Data, 1 sheet.
3. Form SCS-352, Compaction and Penetration Resistance Report, 5 sheets.
4. Form SCS-353, Soil Classification, 1 sheet.
5. Form SCS-357, Summary - Slope Stability Analysis, 2 sheets.

DISCUSSION

FOUNDATION

A. Bedrock: The bedrock at this site is described by the geologist as a weakly foliated granite gneiss intruded with coarse grained granite pegmatite. It occurs at a depth of from about 5 feet to 10 feet on the left abutment. On the right abutment the glacial till reaches a thickness of about 80-feet where the bedrock has been entrenched by a preglacial valley.

B. Soil Classification: The Recent alluvium overlies alluvium outwash in the vicinity of the stream channel. Samples 304.1 and 305.1 represent Recent alluvium. They are classed as SM and GP. The GP contains 76 percent plus No. 4 size material. The alluvium outwash is represented by samples 501.1, 501.2, and 6.1. These materials are classed as GW, CL, and GP-GM respectively. In the field the GW and the GP-GM contain 75 percent plus No. 4 size material. The CL contains 95 percent fines, the liquid limit is 24 and the PI is 9.

The glacial till is represented by samples 504, 9.1, 257, and 260. In the fild the materials represented contain from 16 to 29 percent plus No. 4 size material and from 23 to 29 percent fines. They are classed as low to non-plastic SM and GM.

C. Density: The alluvium outwash and the glacial till are relatively dense. Blow count in the alluvium outwash ranged from 58 blows per foot to more than 100 blows per foot. Tests in the till showed blow count in excess of 100 blows per foot for a 300 pound hammer falling 24 inches on a standard sampler.

2 -- Charles H. Dingle -- 3/1/68
Lorn P. Dunnigan
Subj: ENG 22-5, New Hampshire WP-08, Cold River Watershed Project, Basin Brook Multiple Purpose Dam, Site No. 1

EMBANKMENT

A. Classification: The borrow material will consist primarily of glacial till from the emergency spillway. The till is represented by samples 257.1 and 260.1. It is classed as non-plastic SM. It contains from 23 percent to 28 percent fines and 7 percent finer than 0.002 mm.

Some outwash material from the approach section to the spillway may be used. This material is represented by sample 101.1. It is classed as GW. In the field the material represented contains 75 percent plus No. 4 size material and 3 percent fines.

Sample 253.1 represents a gravelly material classed as GW-GM that will be utilized in the fill.

B. Compacted Density: Standard Proctor compaction tests were made on the minus No. 4 fraction on five of the borrow samples submitted. The maximum dry densities obtained ranged from 117.0 pcf to 121.5 pcf.

In addition to the standard Proctor compaction tests relative density tests were made on samples 68W1827 (253.1) and 68W1832 (101.1). The tests were made in accordance with ASTM D 2049-64T. The test data obtained are summarized as follows:

Sample No.	Size Fraction Tested	Maximum Density pcf	Minimum Density pcf
68W1827	Minus 1 1/2"	139.7	115.5
68W1832	Minus 1 1/2"	141.1	118.5
68W1832	Minus 1 3/4"	134.7	111.4

C. Shear Strength: A CU triaxial shear test was made on sample 68W1829. This sample represents the majority of the embankment material. The test was made on the minus No. 4 fraction compacted to 95 percent of Proctor density. The test specimens were soaked prior to testing. The shear test values obtained are ϕ = 35 1/5°, c = 275 psf. The degree of saturation was low (< 79%) but based on the method used for testing we suggest the test values as design values.

D. Permeability: Permeability tests were made on sample 68W1829 (257.1) to represent the core material and on sample 68W1832 (101.1) to represent the shell material. The test on the core material (68W1829) was made on the minus No. 4 fraction compacted to 95 percent of Proctor density. The test on the shell material (68W1832) was made on the minus 3/4 inch fraction compacted to 70 percent of relative density (test density = 126.4 pcf).

3 -- Charles H. Dingle -- 3/1/68
Lorn P. Dunnigan
Subj: ENG 22-5, New Hampshire WP-08, Cold River Watershed Project.
Basin Brook Multiple Purpose Dam, Site No. 1

The permeability rates obtained are summarized as follows:

Sample No.	Initial Test γ_d pcf	Percent Plus No.4	2000 psf Load K_{fpd}	2000 psf Load Consolidation %	4000 psf Load K_{fpd}	4000 psf Load Consolidation %	8000 psf Load K_{fpd}	8000 psf Load Consolidation %
68W1829	115.5	0	0.01	0.23	0.01	3.0		
68W1832	126.4	47	6.00	0.03	8.0-12.0	0.1	12.0-16.7	0.3

It was apparent that sample 68W1832 piped along the side of the permeameter in one place. Based on the test data it appears that the pipe occurred during the 2000 psf load. The rate of 6 fpd is considered to be reliable since this rate was fairly constant over a three day test period and when the rate started increasing it increased steadily from 6.0 fpd to the final rate measured which was 16.7 fpd.

E. Durability: Los Angeles abrasion tests were made on the plus No. 4 fraction of sample 68W1832 and on 68W1835. The tests were made in accordance with Federal Specification SS-R-406C, Method 208.11. Gradation A (3/8" to 1 1/2") was used for sample 68W1832 and gradation E (1 1/2" to 3") was used for 68W1835. The loss during the test was 36.2 percent for sample 68W1832 and 21.2 percent for sample 68W1835.

The sodium sulfate soundness tests are still in progress on these two samples and data will be included in a supplemental report.

SLOPE STABILITY

The stability of the proposed 3:1 slopes was checked with a Swedish circle method of analyses. The foundation was considered to be strong enough so that the failure arcs would be limited to the embankment. A phreatic line was assumed from emergency spillway elevation to a drain at c/b = 0.6. The factor of safety obtained on the downstream slope is Fs = 2.9 and factor of safety obtained on the 3:1 upstream slope is Fs = 1.88. The embankment will consist primarily of SM glacial till, therefore, a homogeneous embankment with shear strength values of ϕ = 35 1/2°, c = 275 psf was assumed for the analyses.

SETTLEMENT ANALYSES

The blow count data indicate that the foundation materials are dense and very little consolidation is expected for the fill height proposed.

4 -- Charles H. Dingle -- 3/1/68
Lorn P. Dunnigan
Subj: ENG 22-5, New Hampshire WP-08, Cold River Watershed Project, Basin Brook Multiple Purpose Dam, Site No. 1

RECOMMENDATIONS

A. Cutoff: A cutoff through the pervious alluvium outwash to bottom on bedrock is proposed. On the abutment outside the limits of the alluvium outwash it is planned to bottom the cutoff in the dense glacial till. It is reported that near positive cutoff is expected with the trench depth as suggested and we concurr with this proposal.

The trench should be backfilled with glacial till compacted to a minimum of 95 percent of standard Proctor density with the control based on the minus No. 4 fraction. The placement moisture content should be slightly wet of optimum.

If samples 6.1, 305.1, and 501.1 represent the coarsest floodplain material a transition zone will not be required between the till used for backfill and the coarse alluvium. The relationship between the till and the alluvium is shown on the attached Form SCS-353.

B. Principal Spillway: The proposed location crosses the centerline of dam at DH 302. The foundation material consists of dense alluvium outwash overlying bedrock. The outwash ranges from about 6 feet thick to 16 feet thick and is mantled with from 4 to 7 1/2 feet of Recent alluvium. The blow count data indicate that the consolidation potential of the foundation will be negligible.

The alluvium outwash varies from GW to CL and the permeability may be expected to be highly variable.

Rock excavation will be required in the outlet channel.

The proposed location appears to be satisfactory. ✓

C. Drain: With the cutoff trench proposed it is reported that near positive cutoff is anticipated since seepage through the bedrock and through the dense till is expected to be very low.

The embankment will consist primarily of a non-plastic SM that is considered to be moderately susceptable to piping, therefore, we recommend drainage to control the phreatic line.

By careful selection of locally available material, it may be possible to construct a blanket drain below permanent pool elevation. Sample 68W1832 represents a clean gravelly soil classed as GW. The on site gravelly materials are graded over a wide size range. This material will be subject to segregation unless precautions are taken during

placement. Because of the wide range in sizes, it is extremely important that material of this type that is used for a drain contain less than 5 percent non-plastic fines. The test specimen from sample 68W1832 contained 7 percent fines and the permeability rate was only 6.0 fpd for a placement density of 70 percent of relative density.

D. Embankment Design:

1. Placement of Materials: The glacial till represented by samples 257.1 and 260.1 will make up the majority of the fill. This type of material should be placed at a minimum of 95 percent of standard Proctor density with the control based on the minus No. 4 fraction. The placement moisture content should be slightly wet of optimum.

   Gravelly material like sample 101.1 that is used should be utilized in the shell sections. It should be placed with a method specification that will result in about 133 pcf on the minus 1 1/2 inch fraction. This is equal to 70 percent of relative density on the fraction finer than 1 1/2 inches.

2. Slopes: The proposed 3:1 slopes have adequate factors of safety.

3. Settlement: An overfill allowance of 0.75-foot is suggested to compensate for residual consolidation in the fill.

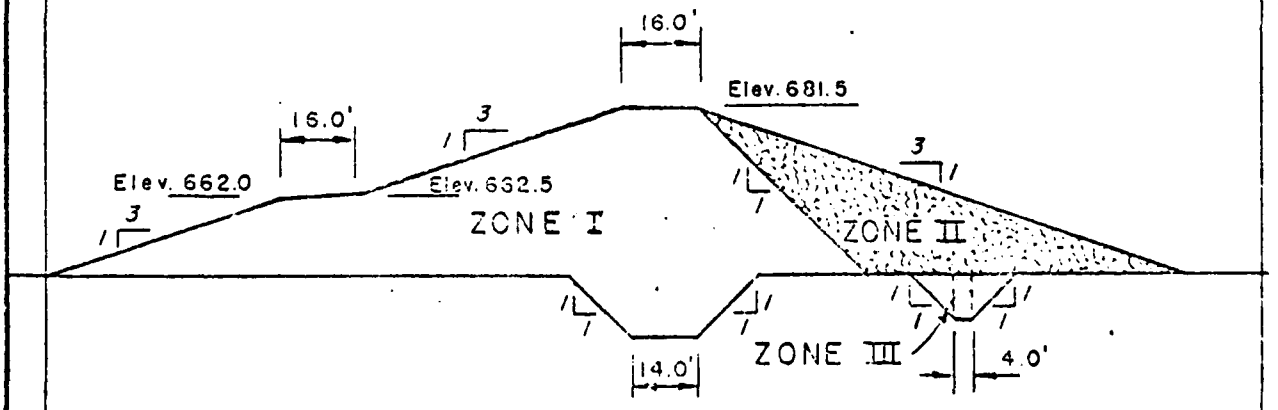
Lorn P. Dunnigan

cc:
Charles H. Dingle, Durham (3)
Neil F. Bogner, Upper Darby

U S DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

DESIGN REPORT SUMMARY

I	Watershed Data		
	A. Structure Class	"c"	
	B. Drainage Area	1920	Ac.
	C. Time of Concentration - T_c	0.7	Hrs.
	D. Hydrologic Curve Number - C_n		
	1. Moisture Condition II	70	
II	Principal Spillway		
	A. Conduit		
	1. Inside Dia.	30	In.
	2. Length	216	Ft.
	B. Riser		
	1. Inside Dimensions	3.0 x 9.0	Ft.
	2. Height (Floor to Crest)	28.0	Ft.
	C. Weir Length	18.0	Ft.
	D. Orifice Dimensions	27x11 3/8	In.
	E. Reservoir Drain Size	24	In.
	F. Type of Energy Dissipater	Plunge Pool	
III	Emergency Spillway		
	A. Width	225.0	Ft.
	B. Side Slopes	4:1 and 3:1	
	C. Length of Level Section	50	Ft.
	D. Exit Slope	0.04	Ft/Ft.
	E. Max. Velocity in Exit Section @ D. H. W.	3.9	Ft/Sec.
	F. Duration of Flow thru Emer. Spillway @ D. H. W.	2	Hrs.
	G. Frequency of Use	1%	
IV	Earth Fill		
	A. Height	45.5	Ft.
	B. Volume	53,000	C. Y.
	C. Compaction	Class A, Y and S	



FILL PLACEMENT

B-8

DF-3

Sheet 2

U. S. DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

Element of Structure	Determining Factor	Elevation	Surface Area Acres	Storage		Inflow		Peak Outflow c.f.s.
				Acre-Feet	Inches*	Volume Inches*	Rate c.f.s.	
Invert of orifice	100 year sediment accumulation	661.5	28.5					
Crest of riser	10 year frequency storm, moisture condition AMC II	670.5	59.0	416.0	2.60			60
Crest of emergency spillway	100 year frequency storm, moisture condition AMC II	675.5	73.0	736.0	4.60			185
Design high water [1]	1.0 X value from ES-1020 Sh.4of5 ** moisture condition AMC II	675.7	74.0	752.0	4.70	4.81	5307	210
Top of dam [1]	1.0 X value from ES-1020 Sh.5of5 ** moisture condition AMC II	681.3 [2]	93.0	1226.0	7.66	16.03	15,661	7910

*Volume expressed in inches of runoff from controlled watershed area of 1920 acres.

**Refer to hydrologic criteria in National Engineering Memorandum SCS-27

Time required to empty flood storage is 8.15 days

[1] Routings started at 6 day drawdown elevation from E.S. crest.

[2] Top of dam actually set at elevation 681.5

Sheet 13

N. H. WATER RESOURCES BOARD
Concord, N. H. 03301

DAM SAFETY INSPECTION REPORT FORM

Town: Chatham Dam Number: 43.04

Inspected by: Robert B. Chamberlin Date: Oct. 12 19 73

Local name of dam or water body: Cold River Site #1

Owner: N.H. Water Resources Board Address: _____

Owner was/was not interviewed during inspection.

Drainage Area: 3.0 sq. mi. Stream: Basin Brook

Pond Area: 68 surcharge / 30 permanent Acre, Storage 736 Ac-Ft. Max. Head 57 Ft.

Foundation: Type Soil, Seepage present at toe - Yes/No, no

Spillway: Type 2-stage Drop-inlet, Freeboard over perm. crest: 5.5,

Width 36" Diameter, Flashboard height _____,

Max. Capacity 185 c.f.s.

Embankment: Type Earth, Cover Vegetated Width 16',

Upstream slope 3 to 1; Downstream slope 3 to 1

Abutments: Type _____, Condition: Good, Fair, Poor

Gates or Pond Drain: Size 24" Capacity _____ Type _____

Lifting apparatus _____ Operational condition _____

Changes since construction or last inspection: _____

Downstream development: _____

This dam would/would not be a menace if it failed.

Suggested reinspection date: _____

Remarks: Emergency spillway 220' wide

MAINTENANCE CHECKLIST FOR PL 566 FLOOD CONTR STRUCTURES

This maintenance checklist is a guide for determining the maintenance required for Public Law 566 flood control structures in New Hampshire. It doesn't take the place of experience and judgment and is not inclusive. Items of a difficult nature to check, such as principal spillway conduit condition, are not included. Intensive checks of these items are necessary at proper intervals. Review of As Built drawings, the design folder, structure history, and previous maintenance reports should be part of the inspection. Prompt maintenance is a vital part of safe and effective operation.

Except where otherwise indicated, completion of this form may be facilitated by ranking maintenance items on a 1 to 4 basis where

1 = satisfactory
2 = satisfactory, but check carefully at next inspection
3 = requires maintenance this season
4 = requires immediate attention.

WATERSHED Cold River SITE 1 DATE 6-19-78

INSPECTED BY Suhr & MacPherson (SCS); G. Kerr (NHWRB); D. Clymer (FS)

1. GENERAL ITEMS

Access Road.	1
Site Fencing.	2
Traffic Conditions.	2
Vandalism Control.	2
Trash Control.	4

COMMENTS Still some indication of traffic across spillway but better than past years. Trash and debris on upstream face of dam is killing vegetation.

2. RESERVOIR

Timber stand at reservoir.	1
Debris and slash.	1
Sediment level in relation to low stage inlet	1

COMMENTS

3. EMBANKMENT AND EXCAVATED SLOPES

(Report riprap and vegetation and erosion condition under Items 4 and 5.)

	Dam	Dike	Emergency Spillways 1/ left	Emergency Spillways 1/ right	Other (____)	Other (____)
Sliding or sloughing	4	—	—	4	—	—
Holes (rodent and other) (check especially at embankments)	1	—	—	1	—	—
Excessive settlement (embankments)	1	—	—	1	—	—
Cracks						
Traverse	1	—	—	1	—	—
Longitudinal	1	—	—	1	—	—
Seepage 2/	1	—	—	1	—	—
Piping 2/	1	—	—	1	—	—

COMMENTS Toe of slope at inlet to emergency spillway badly eroded or gouged. Area around riser badly eroded.

4. RIPRAP

	Displ. of Rock	Loss of Spalls	Loss of Bedding	Erosion of Found.	Breakdown of Rock
Dam					
Upstream berm	—	—	—	—	—
Principal Spillway Outlet	—	—	—	—	—
Embankment Gutters					
left	—	—	—	—	—
right	—	—	—	—	—
Emergency Spillway					
location_____	—	—	—	—	—
location_____	—	—	—	—	—
Waterways					
location_____	—	—	—	—	—
location_____	—	—	—	—	—
Outlet Channel	2	2	2	2	2
Other Drain outlets	2	2	2	2	2

COMMENTS

1/Looking downstream.
2/Check especially at downstream face of embankments.

5. VEGETATION

	Dam	Emergency Spillways left	Emergency Spillways right 1/	Dike	Outlet Channel	Water way	Other (____)
Condition of stand (including need for lime and fertilizer)	1*	___	1	___	___	___	___
Undesirable vegetation	3	___	3	___	___	___	___
Drainage (surface)	1	___	1	___	___	___	___
Erosion 2/	4	___	4	___	___	___	___
Sedimentation	1	___	1	___	___	___	___
Condition of planting	1	___	1	___	___	___	___
Pest control	1	___	1	___	___	___	___
Fire control	1	___	1	___	___	___	___

COMMENTS *Small area on upstream face of dam at crest needs revegetation. Remove small poplars on dam and in emergency spillway.

6. EMBANKMENT, STRUCTURAL, & OTHER DRAINS

		Dam left	Dam right 1/	Other (____)	Other (____)
Depth of Flow (in inches above invert)	With any obstruction	½	-	___	___
	Without any obstruction	½	1/8	___	___
Turbidity of Discharge (yes, no)	With any obstruction	no	___	___	___
	Without any obstruction	no	no	___	___
Condition of Protective Coating	Outside	2	2	___	___
	Inside	2	2	___	___
Obstruction in Flow (yes, no)		yes	no	___	___
Animal Guard Condition		1	1	___	___
Outlet Condition		1	1	___	___

Retarding Pool Elevation (ft. msl)_____ or_____(ft.) above / below _____

Other_____

COMMENTS Iron algae in outlet of left toe drain partially removed.

1/Looking downstream.
2/Including wave, surface, stream, manmade, and livestock erosion.

7. RISER

Caution Be extremely careful when using ladders. Check condition before using. Ladders are sometimes broken, loose, corroded, and or slippery.
Use safety harness.

Ladders:
~~in~~ out None
Condition of protective coating___; Corrosion___; Damaged parts___; Loose___; Other___.

Concrete:
~~in~~ out
Cracking 1 ; Spalling 1 ; Other deterioration 1 ; Excessive movement (check joint at riser and conduit)___; Other___.

Trashracks:
low and high stage
Condition of protective coatings 3 ; Corrosion 3 ; Damaged parts 1 ; Condition of fastenings 3 ; Need of gratings due to beaver 1 ; Safety condition (protruding fastenings, sharp edges, etc.) 1 ; Other 1 .

Manhole:
Condition of protective coatings 4 ; Corrosion 4 ; Damage 4 ; Lock operable 4 ; Other 4 .

Gate:
including lifting device, stem, guides, disc
Condition of protective coating 4 ; Corrosion 4 ; Damaged parts 4 ; Condition of fastenings 1 ; Stem alignment___; Lubrication 4 ; Operation___; Other___.

Safety Items:
Condition of warning signs___; Condition of safety equipment___; Other___.

COMMENTS NHWRB will check inside of riser, gate operation, ladder, etc., galvanizing worn off bottom of L.S. trash rack and metal starting to rust. Manhole cover rusting, lock and bolts gone. Plastic stem cover gone, stem rusting and appears to need lubrication. Gate stand needs painting.

8. IMPACT BASIN, SAF, OX INLET, & MISCELLANEOU CONCRETE STRUCTURES

(specify)_____ _____

Concrete: inside and out	Cracking___; Spalling___; Other deterioration ___; Excessive movement (check joints)___; Waterstops___; Joint sealant___; Other___.
Trashracks: low and high stage	Condition of protective coatings___; Corrosion ___; Damaged parts___; Condition of fastenings___; Need of gratings due to beaver___; Safety condition (protruding fastenings, sharp edges, etc.)___; Other___.
Gates: including lifting device, stem, guides, disc, flap	Condition of protective coating___; Corrosion ___; Damaged parts___; Condition of fastenings___; Stem alignment___; Operation___; Lubrication___; Wood decay___; Other___.
Structure Drainage:	Report under "Embankment and Other Drains"
Structure, Railing, Grates, Barriers, etc.	Condition of protective coating___; Corrosion ___; Damaged parts___; Condition of Fastenings___; Wood decay___; Safety condition (protruding fastenings, sharp edges, etc.) ____; Other___.
Safety Items:	Condition of warning signs___; Condition of safety equipment___; Other___.

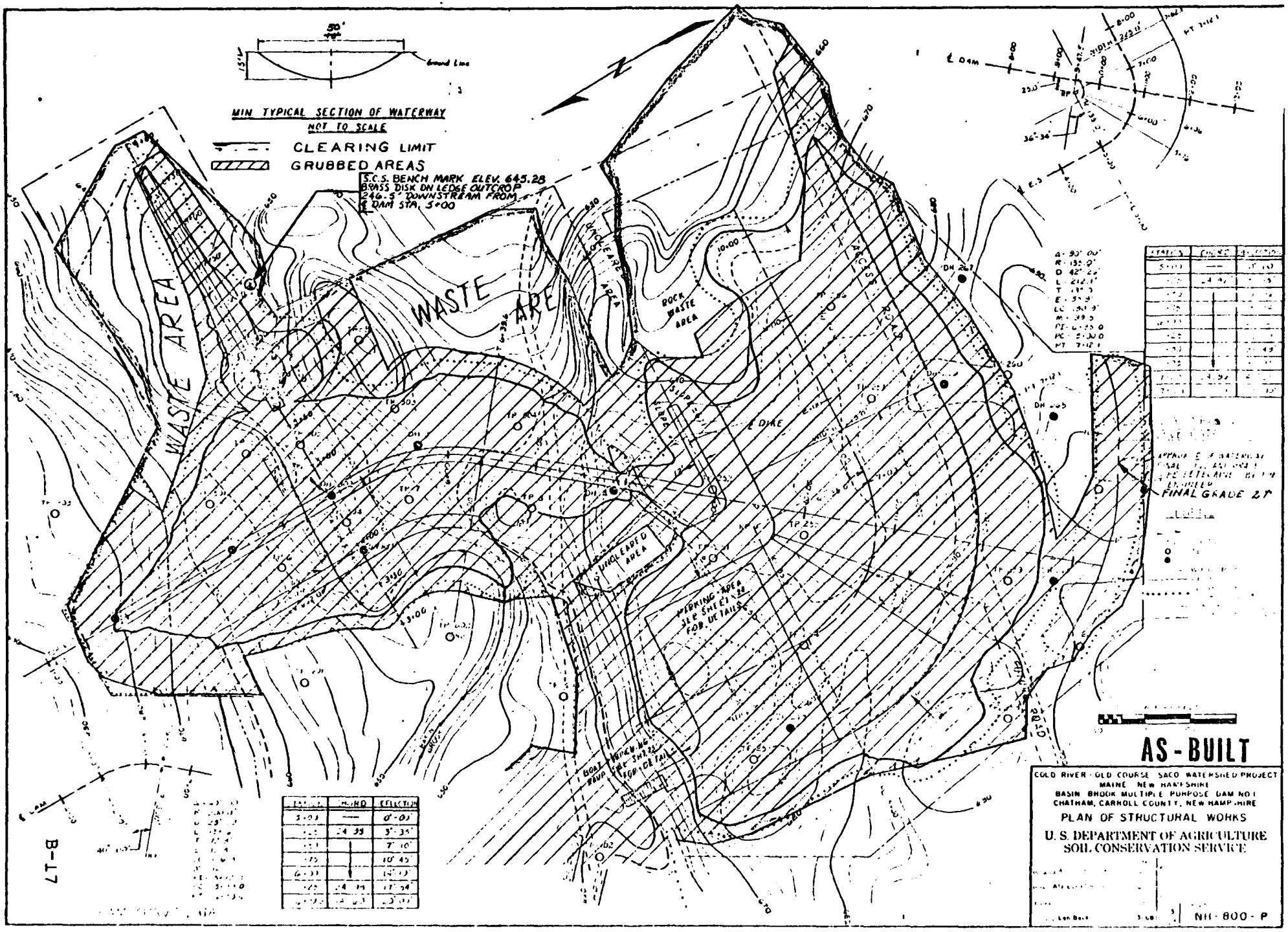
COMMENTS_____

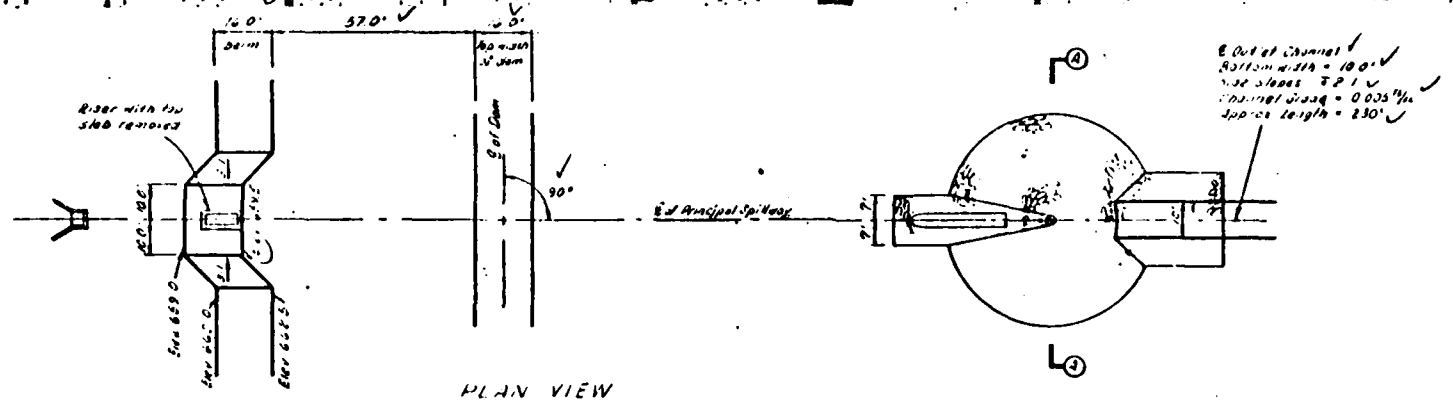
9. CHANNEL

Stream obstructions.	1
Debris in stream.	1
Sediment bars controlled.	1
Plunge pool stability.	1
Fish habitat appurtenances	-

Riprap -- Report under "Riprap" (item 4)

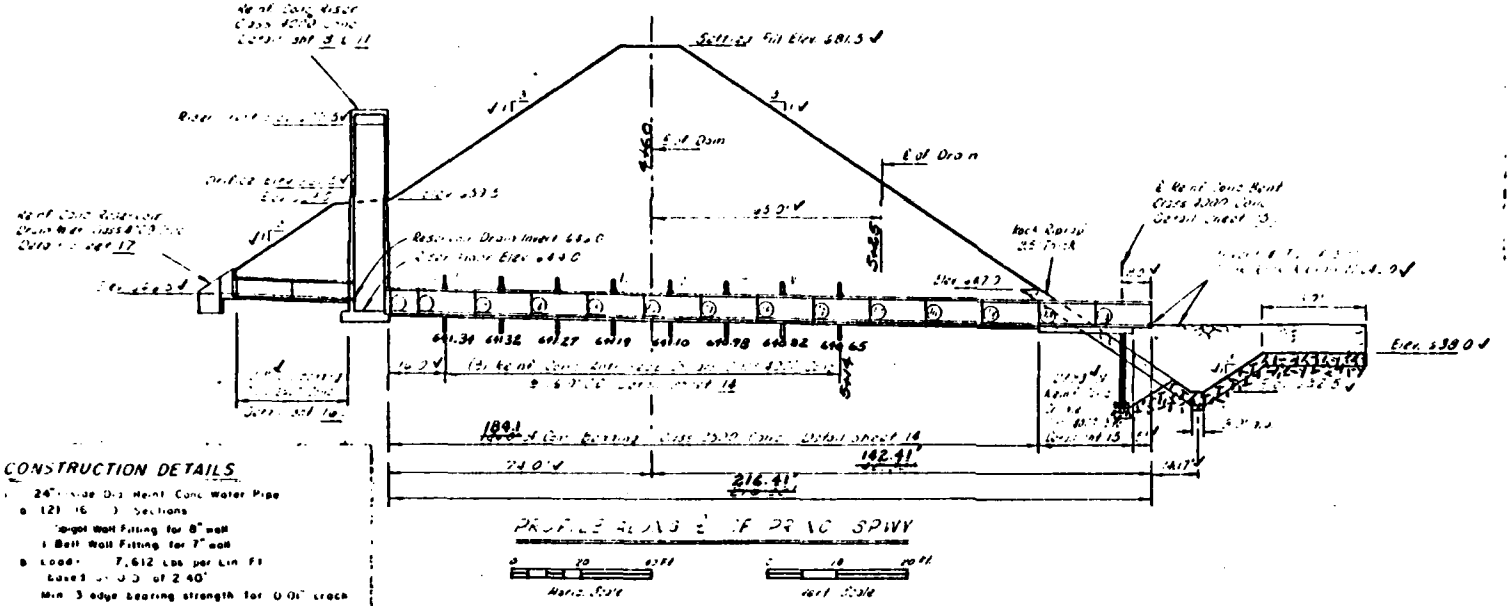
COMMENTS_____


MIN TYPICAL SECTION OF WATERWAY
NOT TO SCALE
CLEARING LIMIT
GRUBBED AREAS
S.C.S. BENCH MARK ELEV. 645.28
BRASS DISK ON LEDGE OUTCROP
246.5' DOWNSTREAM FROM
℄ DAM STA. 5+00
WASTE AREA
WASTE AREA
ROCK WASTE AREA
℄ DIKE
FINAL GRADE 2T
PIPING AREA
SEE SHEET 22
FOR DETAILS
AS-BUILT
COLD RIVER - OLD COURSE SACO WATERSHED PROJECT
MAINE NEW HAMPSHIRE
BASIN BROOK MULTIPLE PURPOSE DAM NO 1
CHATHAM, CARROLL COUNTY, NEW HAMPSHIRE
PLAN OF STRUCTURAL WORKS
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NH-800-P
B-17



PLAN VIEW

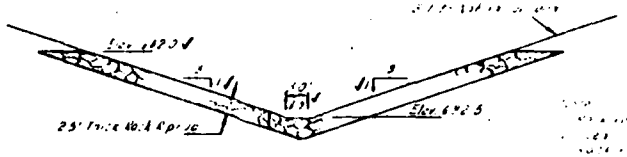
Scale



PROFILE ALONG ℄ OF PRINCIPAL SPWY

Horiz. Scale

Vert. Scale



SECTION AA

CONSTRUCTION DETAILS

a 24" Dia Reinf Conc Water Pipe
(2) 16' Sections
Spigot Wall Fitting for 8" wall
1 Bell Wall Fitting for 7" wall

b Load: 7,612 Lbs per Lin Ft
Bases: 2.0 of 2.40'
Min 3 edge bearing strength for 0.01" crack (non-prestressed pipe): 3,820 Lbs per Ft
AWWA C 300
Min 3 edge bearing strength for 0.001" crack (prestressed pipe): 2,872 Lbs per Ft
AWWA C 301

c Maximum Pressure Head: 34.5 Ft
Minimum Pressure Head: 0 Ft

CONSTRUCTION DETAILS

a 36" Dia Reinf Conc Water Pipe
(19) 6' Sections (1) 8'-0" Section
1 Spigot Wall Fitting for 15" wall

b Load: 29,364 Lbs per Lin Ft
Bases: 2 of 3.67'
Min 3 edge bearing strength for 0.01" crack (non prestressed pipe): 14,907 Lbs per Ft
AWWA C 300
Min 3 edge bearing strength for 0.001" crack (prestressed pipe): 11,208 Lbs per Ft
AWWA C 301

c Maximum Pressure Head: 38.0 Ft
Minimum Pressure Head: 0 Ft

AS-BUILT

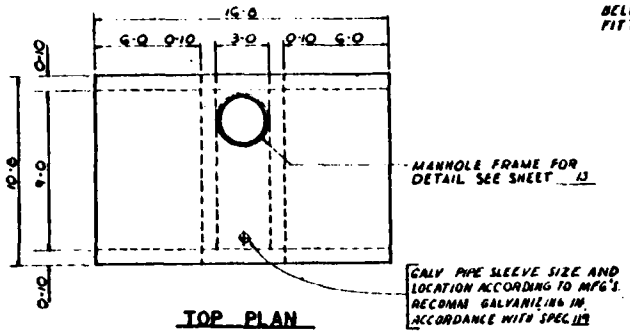
COLD RIVER - OLD COURSE SCCD WATERSHED PROJECT
MAINE NEW HAMPSHIRE
BASIN BROOK MULTIPLE PURPOSE DAM NO 1
CHATHAM, CARROLL COUNTY, NEW HAMPSHIRE

PRINCIPAL SPILLWAY

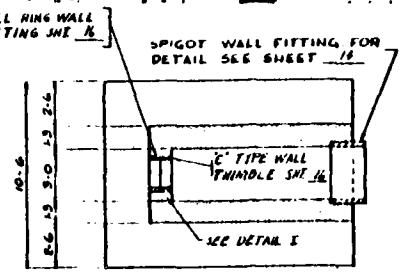
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed A.N. Lahiola 3/68
Drawn Alfredo y/c Mora
Traced
Checked Lee Beck 3/68
Approved by
Title
Date
Drawing No. NH-800-P

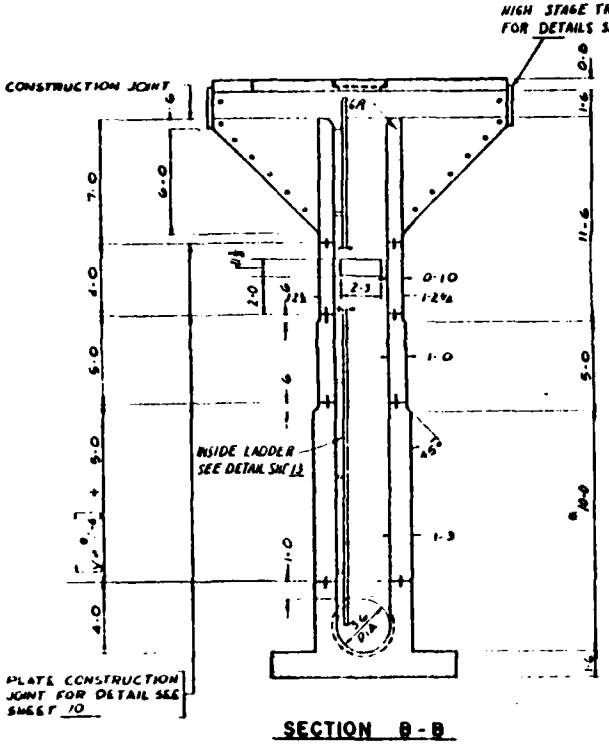
SCS-313C (9-64)



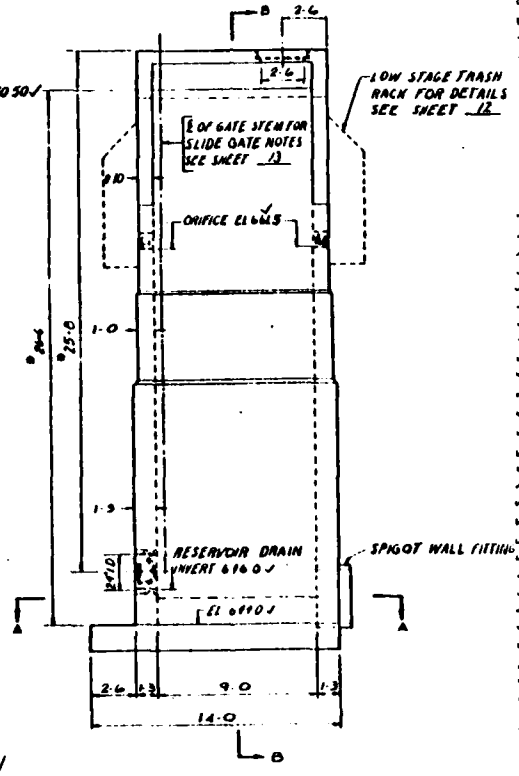
TOP PLAN



SECTION A-A

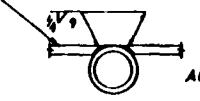


SECTION B-B



SIDEWALL ELEVATION

STEEL PLATE OF THE PLATE CONSTR JOINT SHALL BE CUT AND BUTT WELDED TO WALL THIMBLE



DETAIL 1

0 1 2 3 4 5 6 7 8 9
SCALE IN FEET

* THIS DIMENSION NOT TO SCALE

STEEL SCHEDULE

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
B1	6	14	10-0	1	-	-	140-0
B2	6	11	13-6	1	-	-	148-6
B3	7	42	10-4	21	3-0	6-8	434-0
B4	6	11	13-6	1	-	-	148-6
B5	6	14	10-0	1	-	-	140-0
B6	6	2	4-6	1	-	-	9-0
B7	5	9	7-6	21	0-11	6-7	67-6
B8	6	4	7-5	21	0-11	6-6	29-8
B9	5	26	7-4	21	0-11	6-5	190-0
B10	6	18	10-0	1	-	-	170-0
B11	5	7	4-0	1	-	-	28-0
B12	7	14	10-6	21	3-9	6-9	147-0
B13	7	2	5-5	21	1-6	6-9	11-10
B14	7	2	7-9	21	1-0	6-9	15-6
B15	7	4	7-7	21	0-9	6-9	30-4
B16	7	8	8-1	21	1-3	6-9	64-8
B17	5	2	3-2	1	-	-	6-4
B18	5	2	2-5	1	-	-	4-10
B19	5	1	2-4	1	-	-	2-4
B20	5	2	2-5	1	-	-	4-10
B21	5	2	2-9	1	-	-	5-6
R1	5	46	8-1	1	-	-	370-6
R2	5	36	8-1	1	-	-	291-6
R3	5	33	8-1	1	-	-	267-9
R4	5	4	8-1	1	-	-	32-4
R5	5	1	10-0	1	-	-	10-0
R6	5	1	4-0	1	-	-	4-0
R7	7	8	10-6	21	3-9	6-9	84-0
R8	5	14	9-6	1	-	-	133-4
R9	5	14	3-8	1	-	-	53-4
R10	6	24	10-2	21	3-7	6-7	244-0
R11	5	4	9-6	21	3-4	6-4	38-0
R12	5	30	3-8	1	-	-	110-0
R13	5	10	3-8	1	-	-	36-8
R14	5	20	6-7	1	-	-	131-8
R15	5	6	6-7	1	-	-	39-6
R16	5	22	4-6	1	-	-	99-0
R17	5	10	4-6	1	-	-	45-0
R18	5	14	9-6	1	-	-	133-4
R19	5	10	3-6	1	-	-	36-8
R20	5	28	9-4	21	3-2	6-2	261-4
R21	5	4	9-0	21	3-0	6-0	36-0
R22	5	22	3-8	1	-	-	82-0
R23	5	10	3-6	1	-	-	36-0
R24	5	16	5-7	1	-	-	89-4
R25	5	6	5-7	1	-	-	33-6
R26	5	16	5-7	1	-	-	89-4
R27	5	8	5-7	1	-	-	44-8
R28	5	8	9-8	1	-	-	77-4
R29	5	8	3-8	1	-	-	29-4
R30	5	20	9-0	21	3-0	6-0	180-0

MARK	SEE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
T1	5	16	6-6	1	-	-	104-0
T2	5	12	9-8	1	-	-	116-0
T3	5	8	9-9	1	-	-	78-0
T4	5	6	8-10	1	-	-	53-0
T5	6	8	8-10	1	-	-	63-0
T6	5	28	9-0	21	3-0	6-0	252-0
T7	5	2	9-8	1	-	-	19-4
T8	5	2	9-2	1	-	-	18-4
T9	5	2	12-8	1	-	-	25-4
T10	5	2	11-8	1	-	-	23-4
T11	6	2	14-2	1	-	-	28-4
T12	5	2	16-3	1	-	-	32-6
T13	6	4	7-8	1	-	-	30-8
T14	5	4	6-5	1	-	-	25-8
T15	5	4	5-2	1	-	-	20-8
T16	5	4	5-11	1	-	-	23-8
T17	5	4	2-6	1	-	-	10-0
T18	5	4	10-7	19	2-2	5-5	42-4
T19	5	2	4-3	1	-	-	8-6
T20	5	2	6-6	1	-	-	13-4
T21	5	2	9-2	1	-	-	18-4
T22	5	2	11-8	1	-	-	23-4
T23	5	2	14-2	1	-	-	28-4
T24	5	2	16-3	1	-	-	32-6
T25	5	4	7-6	1	-	-	30-0
T26	5	4	6-3	1	-	-	25-0
T27	5	4	5-2	1	-	-	20-8
T28	5	4	3-11	1	-	-	15-8
T29	6	4	2-8	1	-	-	10-8
T30	5	4	10-7	19	2-2	6-5	42-4
T31	5	2	16-3	1	-	-	32-6
T32	5	2	16-8	1	-	-	33-4
T33	6	24	9-8	1	-	-	233-0
T34	7	2	7-2	21	6-2	7-0	14-4
T35	6	4	16-8	1	-	-	166-8
T36	6	4	6-7	1	-	-	26-4
T37	5	2	2-8	21	1-10	0-10	5-4
T38	5	28	7-9	21	1-0	5-11	217-0
T39	5	2	6-5	21	1-10	6-5	16-6
T40	6	4	6-7	1	-	-	26-4
T41	6	9	16-3	1	-	-	146-8

QUANTITIES FOR RISER

#4 BARS -	577-2	-	384 LBS
#5 BARS -	4291-6	-	4478 LBS
#6 BARS -	1028-8	-	1565 LBS
#7 BARS -	750-0	-	1594 LBS
			7958 LBS

STEEL 44.2 LBS/CU.YD

CONCRETE = 43.0 + 1.35 V = 46.0 CU.YDS

LENGTH OF #5 BARS = (3641-0) + (LENGTH OF BARS R1, R2, R3, R4 AND R6)
LENGTH OF #6 BARS = (988-4) + (LENGTH OF BAR R5)
LENGTH OF #7 BARS = (659-8) + (LENGTH OF BARS R7 (T 39)

AS-BUILT

ALL STEEL PLACED ACCORDING TO DESIGN

STANDARD COVERED RISER	
DESIGN CONSTANTS	f'_c = 4000 psi, f_c = 1600 psi, n = 8, f_s = 20 000 psi
STANDARD DWG NO	ES 3036-3020 E
DATE 5-65	SHEET 1 OF 4

LOEWER SARGENT & ASSOC.
ARCHITECTS & ENGINEERS
3720 FARRAGUT AVE., KENSINGTON, MD.

COLD RIVER OLD COURSE SCS WATERSHED PROJECT
MAINE NEW HAMPSHIRE
BASIN BROOK MULTIPLE PURPOSE DAM NO 1
CHATHAM, CARROLL COUNTY, NEW HAMPSHIRE

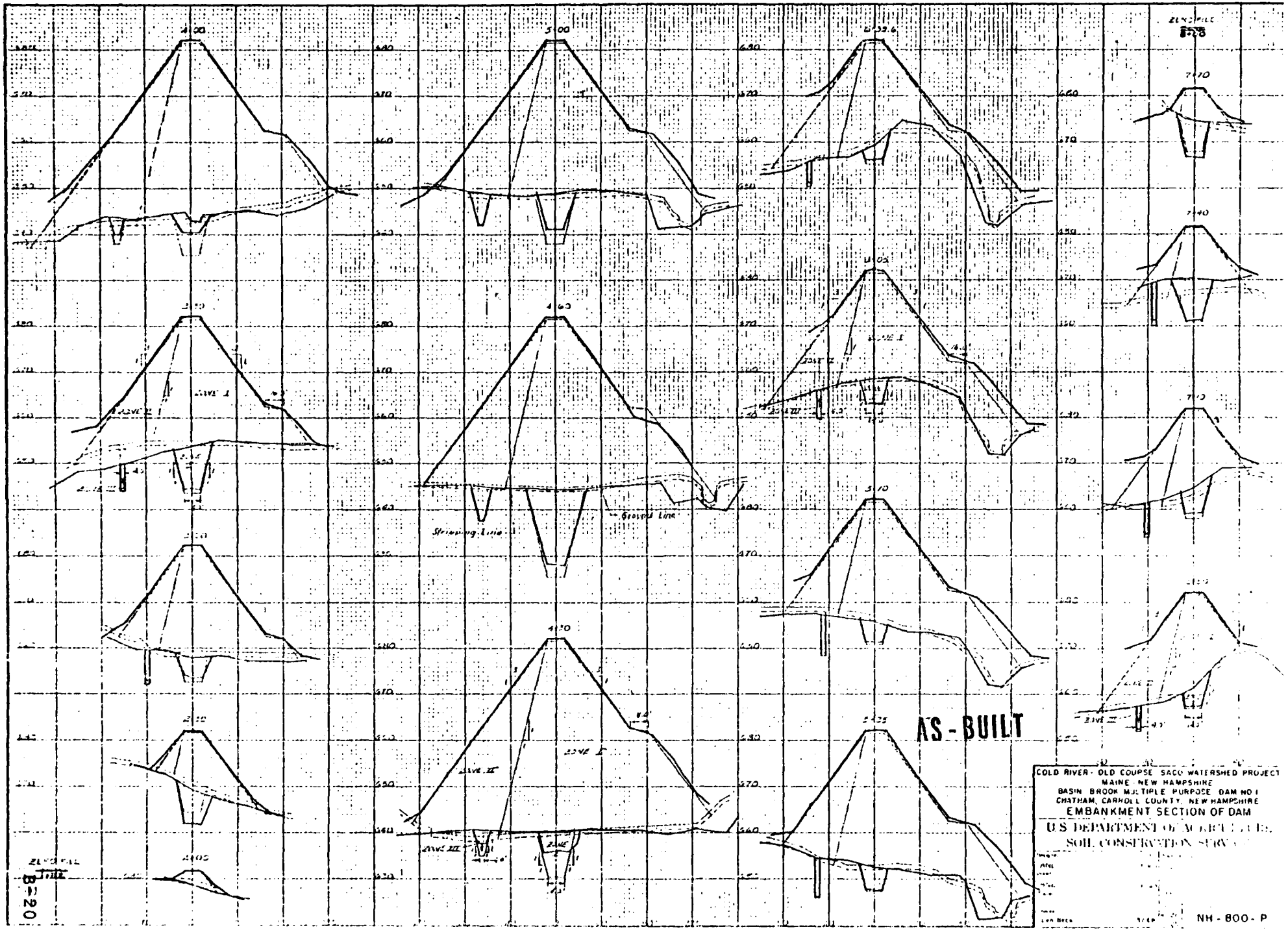
RISER DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Accepted A. N. Lothrop — Date 3/68
Drawn D. R. Berman — Date 3/68
Traced — Date
Checked Leo Beck — Date 3/68

Drawing No. NH-800-P

B-19



COLD RIVER - OLD COUPSE SACO WATERSHED PROJECT
MAINE - NEW HAMPSHIRE
BASIN BROOK MULTIPLE PURPOSE DAM NO 1
CHATHAM, CARROLL COUNTY, NEW HAMPSHIRE

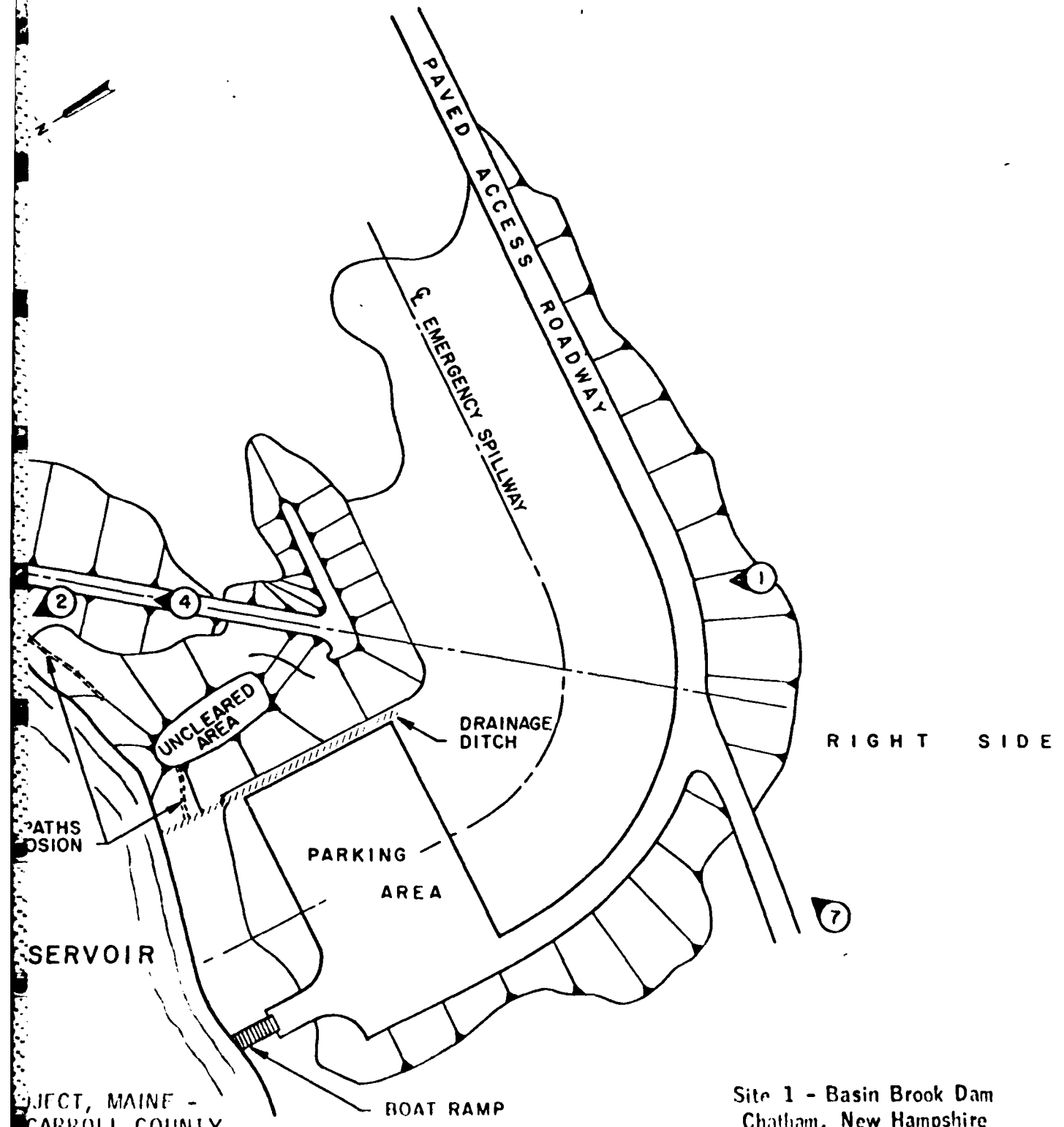
EMBANKMENT SECTION OF DAM

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NH - 800 - P

B-120

APPENDIX C - PHOTOGRAPHS



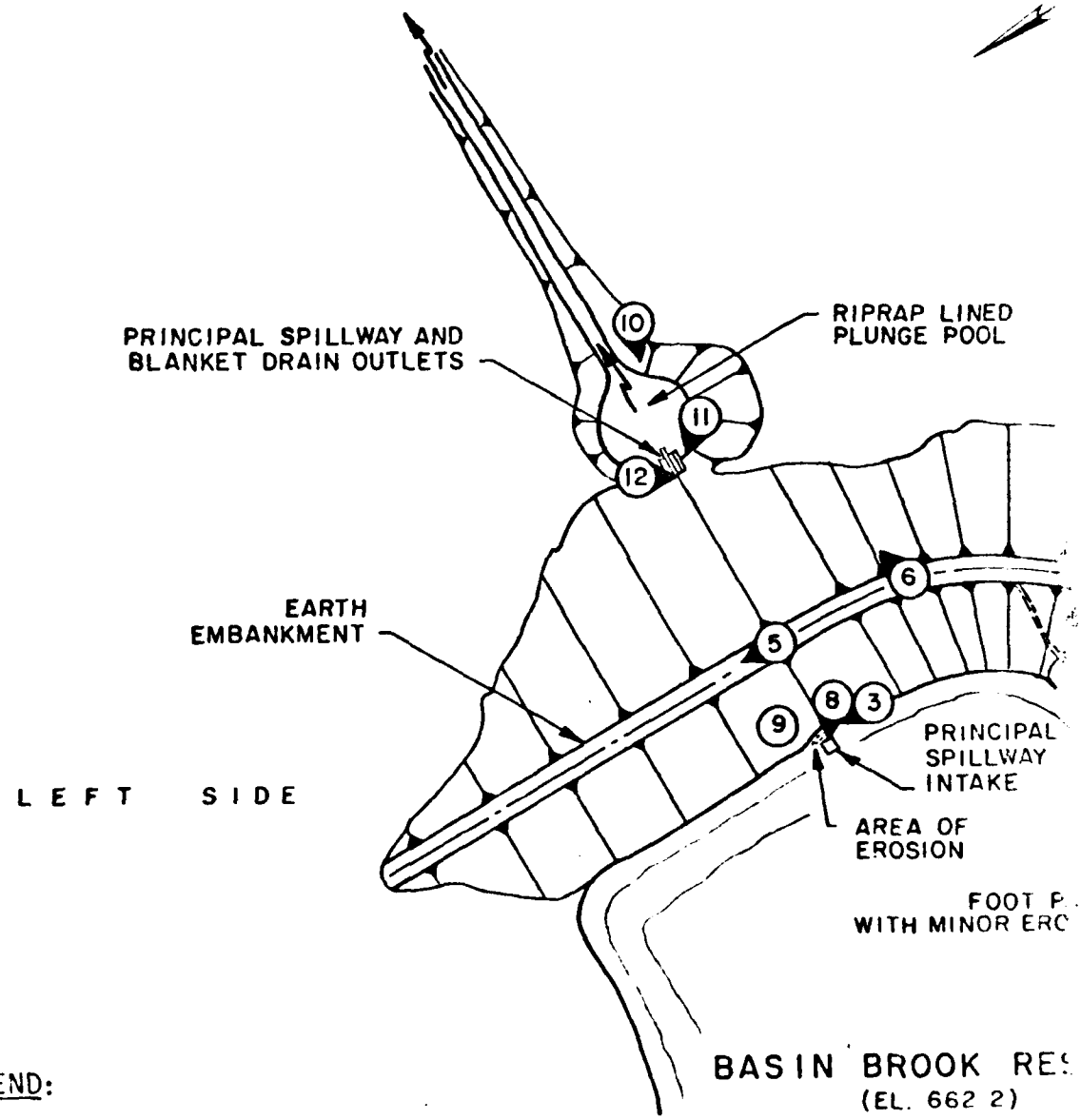
...JECT, MAINE -
...CARROLL COUNTY,
...AGRICULTURE,
...FIELD OBSERVA-

Site 1 - Basin Brook Dam
Chatham, New Hampshire

SITE PLAN SKETCH

Approx. Scale: 1" = 100' February 1980

272



LEGEND:

(2) PHOTO NUMBER AND DIRECTION OF VIEW

NOTE:

PLAN DEVELOPED FROM "COLD RIVER - OLD COURSE SACO WATERSHED PRO NEW HAMPSHIRE, BASIN BROOK MULTIPLE PURPOSE DAM NO. 1, CHATHAM, NEW HAMPSHIRE, PLAN OF STRUCTURAL WORKS", BY U.S. DEPARTMENT OF SOIL CONSERVATION SERVICE, DATED MARCH 1968 (SEE PAGE B - 17) AND TIONS MADE ON 31 OCTOBER 1979.

2. Upstream slope

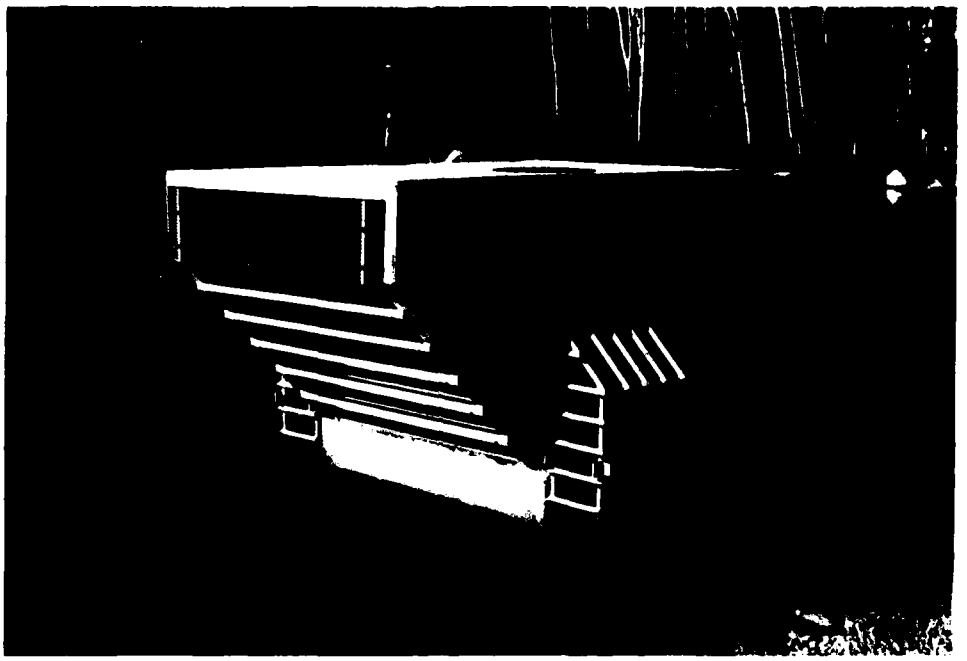
3. Toe of upstream slope adjacent to principal spillway

4. Alignment of embankment crest from right end

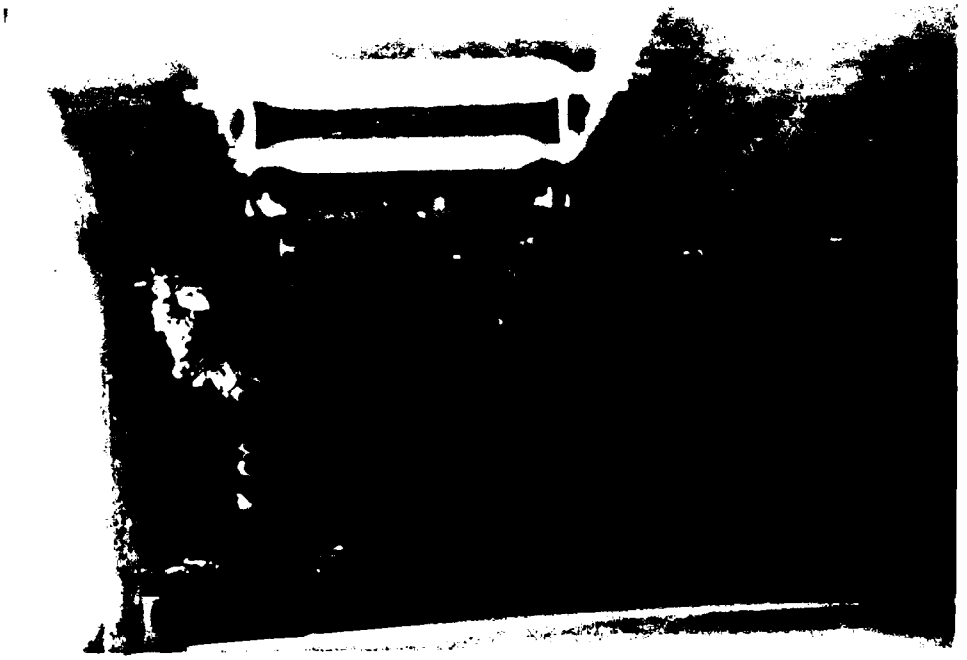
5. Crest of dam and left abutment

6. Downstream slope from crest of embankment

7. Emergency spillway looking downstream

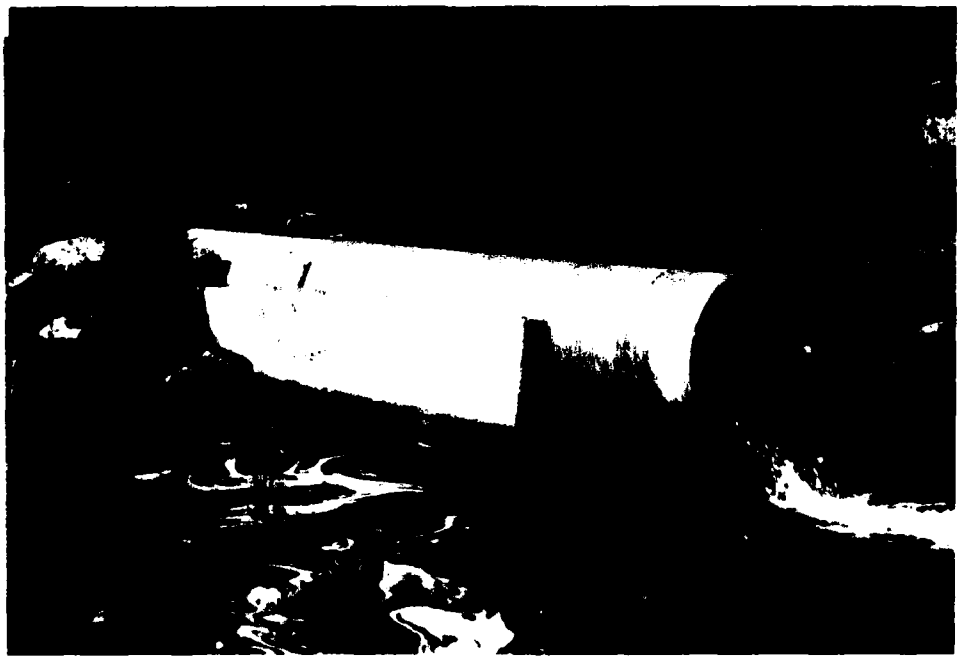


8. Principal spillway



9. Flow into principal spillway through orifices and interior ladder

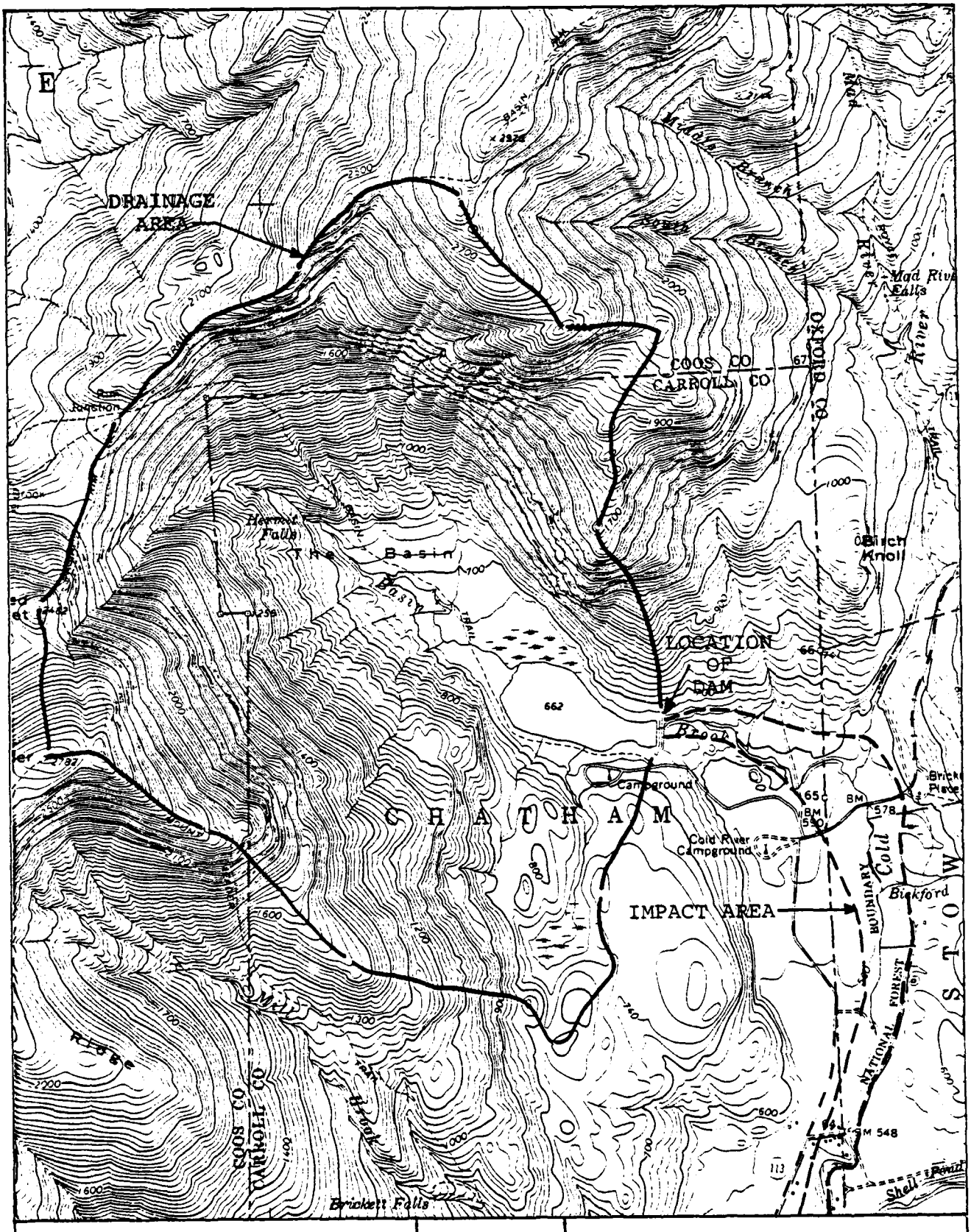
10. Riprap lined plunge pool



11. Principal spillway and blanket drain outlets

12. Flow from blanket drain outlet with iron oxide deposit

APPENDIX D - HYDROLOGIC AND HYDRAULIC COMPUTATIONS



BASIN BROOK DAM NO. 1
NH 00479

DRAINAGE AREA AND DAM FAILURE IMPACT AREA MAP

APPROX. SCALE: 1" = 2000'

CAMP DRESSER & McKEE | CLIENT HALEY & ALDRICH | JOB NO. 561-10-RT-9 | COMPUTED BY JED
PROJECT DAM INSP. | DATE CHECKED 1-22-80 | DATE 1/3/80
DETAIL BASIN BR. DAM #1 | CHECKED BY Joe A. | PAGE NO. 1

1. ELEVATIONS

Top of Dam Elev. 681.5
Toe of Dam Elev. 638.5
Principal Spillway:
Inv. of Orfice Elev. 661.5
Crest of Riser Elev. 670.5
Emergency Spillway Crest Elev. 675.5

1. SURFACE AREAS & STORAGE CAPACITIES

ELEV.	ACRES	STORAGE [2]
661.5	28.5	111.0
670.5	59.0	527.0
675.5	73.0	847.0
675.7	74.0	863.0
681.3	93.0	1337.0

Drainage Area
= 1,920 acres
= 3.0 sq. mi.

Notes:
1. data obtained from designer's records (SCS)
2. Total storage in acre-ft., deduct 111 ac-ft to determine surcharge storage

SIZE CLASSIFICATION

Height = 681.5 - 638.5 = 43 ft.

Storage at top of dam ≃ 1,360 ac-ft.

: Size is INTERMEDIATE

HAZARD CLASSIFICATION

Based on the results of the dam failure analysis, a failure would result in the potential loss of more than a few lives.

: Hazard Classification is HIGH

TEST FLOOD DETERMINATION

For an intermediate size and high hazard, COE Guidelines give a test flood equal to the Probable Maximum Flood (PMF).

COE Guideline Curve give a PMF inflow rate of 2,400 csm for D.A. of 3 sq. mi. having mountanous terrain.

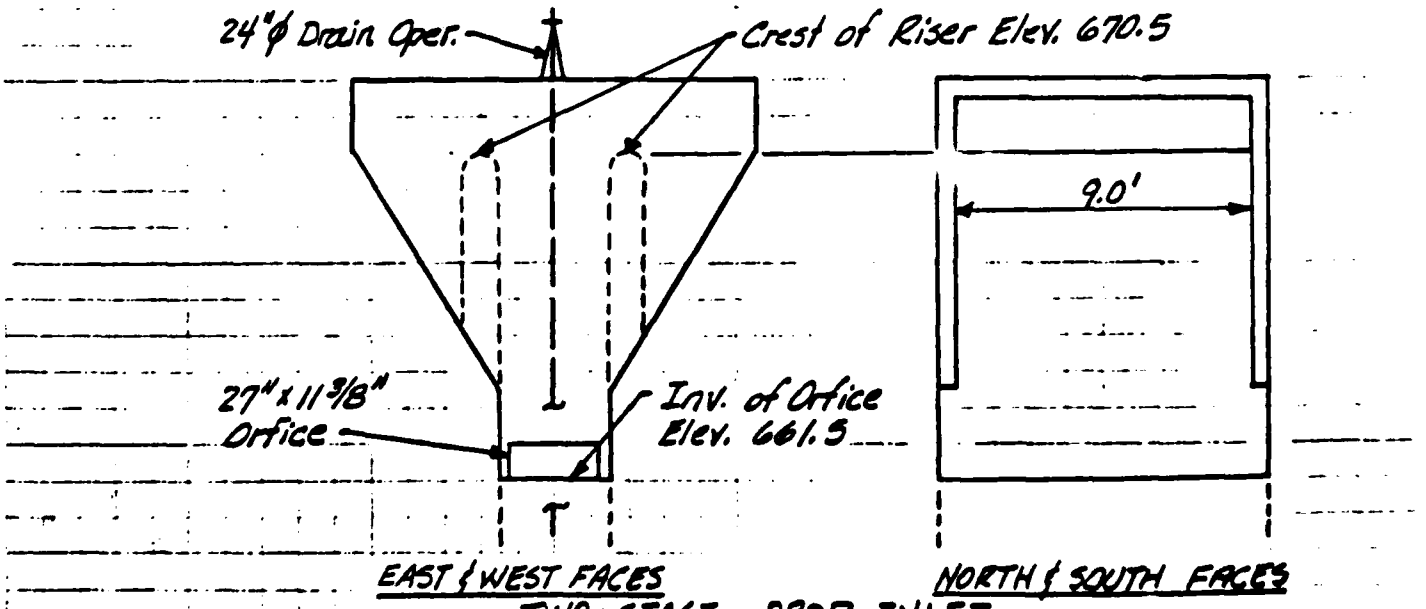
then test flood inflow = 2,400 csm x 3 mi^2 = 7,200 cfs

SPILLWAY AND OUTLET WORKS DETAILS

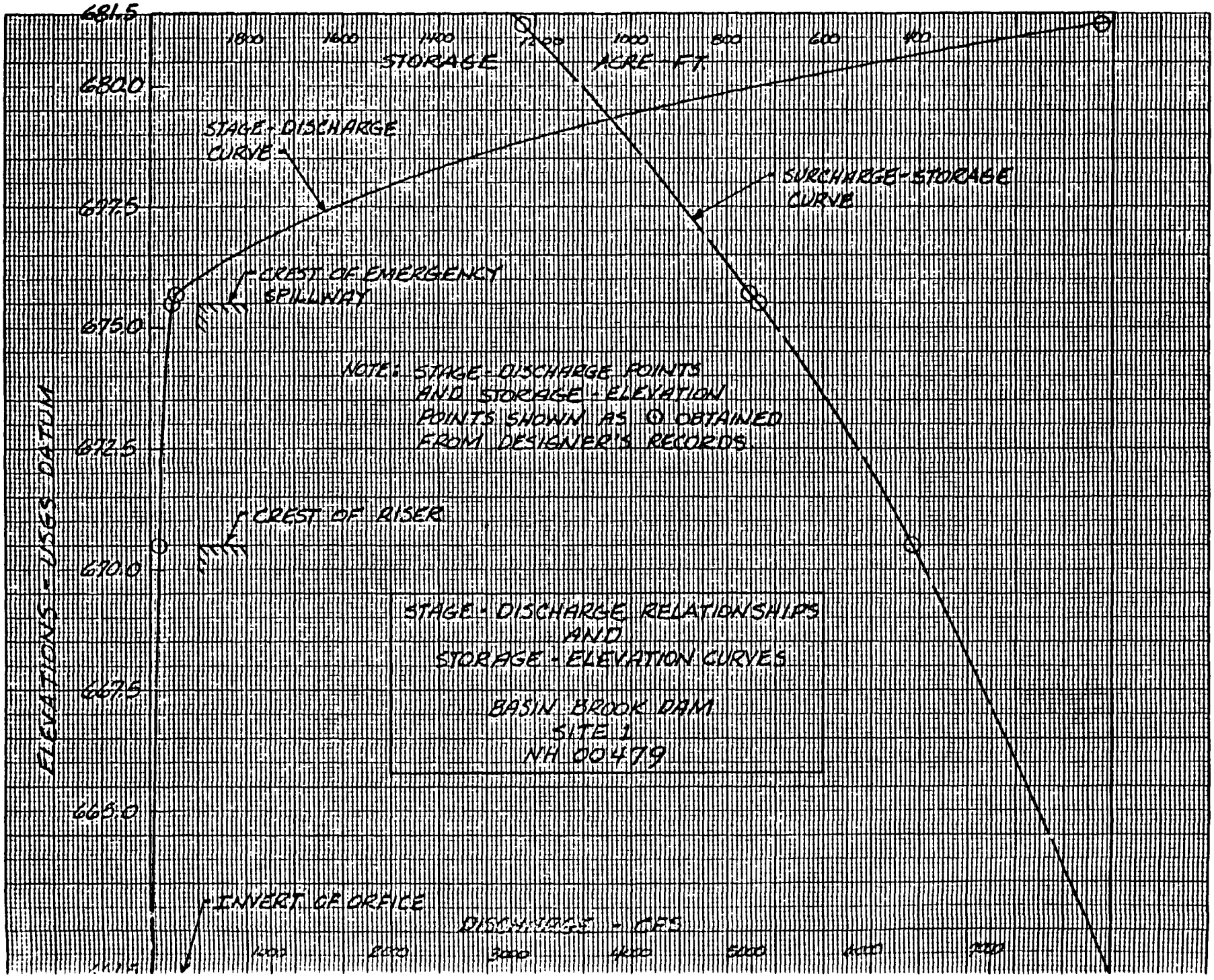
*Principal Spillway: (2-Stage Drop-inlet)
- A. Conduit
  - 1. Inside Dia. - - - - - - - - 36"
  - 2. Length - - - - - - - - - - 216 ft.
- B. Riser
  - 1. Inside Dimensions - - - - 3.0' x 9.0'
  - 2. Ht. (floor to crest) - - - - 28 ft.
- C. Weir Length - - - - - - - - - 18 ft.
- D. Orfice Dimensions - - - - 27" x 11 3/8"

*Emergency Spillway:
- A. Width - - - - - - - - - - - - 225 ft.
- B. Side Slopes - - - - - - - - 4:1 & 3:1
- C. Length of Level Sect. - - - 50 ft.
- D. Exit Slope - - - - - - - - 0.04

Note: * data obtained from designer's records (SCS)



TWO-STAGE DROP-INLET



CAMP DRESSER & McKEE CLIENT HALEY & ALDRICH JOB NO. 561-10-RT-9 COMPUTED BY JED
PROJECT DAM INSP. DATE CHECKED 1-22-80 DATE 1/4/80
DETAIL BASIN BR. DAM #1 CHECKED BY Joe A. PAGE NO. 4

SURCHARGE - STORAGE ROUTING

Test Flood Inflow (Q_{P_1}) = 7,200 cfs

Surcharge Height to pass Q_{P_1} = 681.0

$STOR_1 = \frac{1200 \text{ ac-ft} \times 12"/\text{ft}}{1920 \text{ acres}} = 7.5"$

$Q_{P_2} = Q_{P_1}(1 - STOR/19")$

$= 7200(1 - 7.5/19) = 4,360$ cfs

Surcharge $Ht._2$ = El. 679.6

$STOR_2 = \frac{1070 \times 12}{1920} = 6.69"$

$STOR_{A_1} = (6.69 + 7.5)/2 = 7.1"$

$Q_{P_3} = 7200(1 - 7.1/19) = 4,510$ cfs

Surcharge $Ht._3$ = El. 679.7

$STOR_3 = \frac{1075 \times 12}{1920} = 6.72"$

$STOR_{A_2} = (6.72 + 7.1)/2 = 6.91"$

$Q_{P_4} = 7200(1 - 6.91/19) = 4,580$ cfs, say 4,600 cfs

TEST FLOOD INFLOW = 7200 cfs
ROUTED TEST FLOOD OUTFLOW = 4,600 cfs
TEST FLOOD ELEVATION = 679.75

OUTLET WORKS

The reservoir drain consists of a gated 24" pipe leading from the reservoir to the Drop-Inlet Struct. A 216 ft. long, 36"ϕ conduit conveys discharges from the Drop-Inlet through the dam to the plunge pool at the d/s toe of the dam.

Assume inlet control; with W.S. at Inv. of Orifice (Elev. 661.5)

$Q = 0.85 \times \pi(1)^2 \times (2 \times 32.2 \times 19)^{1/2} = 93$ cfs, say 90 cfs

CAMP DRESSER & McKEE CLIENT HALEY & ALDRICH JOB NO. 3d-10-RT-9 COMPUTED BY JED
PROJECT DAM INSP. DATE CHECKED 1-22-80 DATE 1/4/80
DETAIL BASIN BR. DAM #1 CHECKED BY Joe A. PAGE NO 5

DAM FAILURE ANALYSIS

Height of Dam = 43 ft.
Length of Dam at Mid-height ≈ 350 ft. (from As Builts)

$$Q_f = 8/27\,(.4 \times 350)(32.2)^{1/2}(43)^{3/2} = 66,370 \text{ cfs}$$

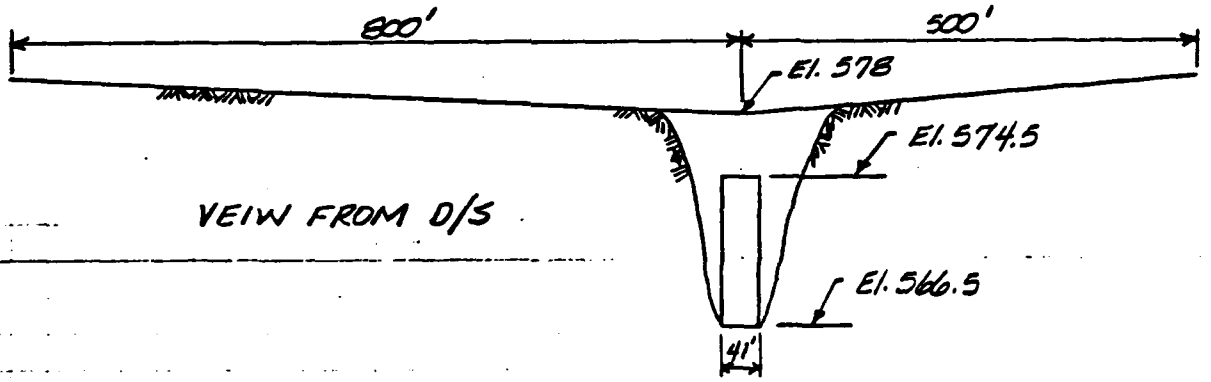
Project discharge with reservoir at top of dam is ~ 8,000 cfs

then combined flow at failure is

$$Q_{P_1} = 8,000 + 66,370 \simeq 74,400 \text{ cfs}$$

Reach No. 1

From dam to Rte. 113 bridge, distance ~ 4,000 ft. Heavily forested, no existing development which could be effected. Bridge ~ 400 ft. d/s of confl. w/ Cold R.



VEIW FROM D/S

X-SECT. OF RTE 113 BRIDGE & EFFECTIVE WEIR

Pressure Flow (Q_c) = $0.85 \times (41 \times 8)(2gh)^{1/2} = 278.8\,(64.4h)^{1/2}$

Weir Flow (Q_w) = $2.8 \times L_L \times (H)^{3/2} + 2.8 \times L_R \times (H)^{3/2}$

WATER ELEV.	BRIDGE FLOW (cfs)	WEIR FLOW Lt. (cfs)	WEIR FLOW Rt. (cfs)	TOTAL FLOW (cfs)	EST. STORAGE (ac-ft.)
578.0	6,130	-	-	6,130	70
580.0	6,900	2,240	1,400	10,540	110
582.0	7,590	11,640	7,270	26,500	150
584.0	8,220	25,040	15,650	48,910	190
586.0	8,810	41,490	25,930	76,230	230

Route Q_{P_1} through Reach 1

$Q_{P_2 T} = 74,400\,(1 - 227/1360) = 61,980$ cfs

$V_2 = 209$ ac-ft.

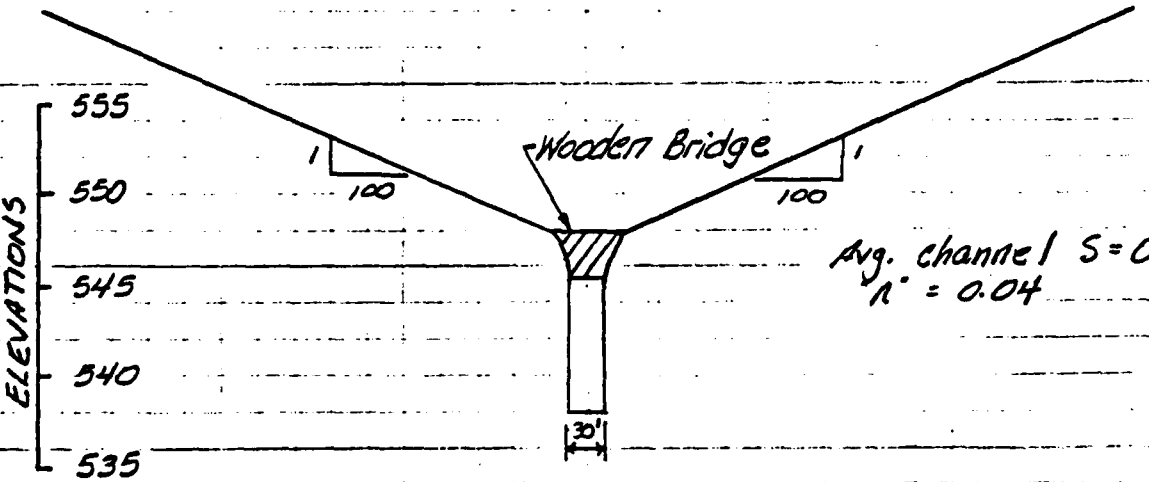
$V_A = (227 + 209)/2 = 218$ ac-ft.

$\therefore Q_{P_2} = 74,400\,(1 - 218/1360) = 62,470$ cfs

Stage = El. 585.0 or 7 ft. above low point of Rte. 113

Reach No. 2

From Reach No. 1 (Rte 113 Bridge) to wooden bridge over Cold River, distance ~ 5,000 ft. Existing development includes one structure ~1600 ft. u/s of wooden bridge on bank of river and ~ 8 cottages on right bank of river at wooden bridge with sill elev. at about top of bridge elev. In the event of a dam failure, assume wooden bridge would be washed out.



Avg. channel $S = 0.0067$
$n = 0.04$

WATER ELEV.	FLOW (cfs)	STORAGE (Ac. Ft.)
550	3,300	180
552	11,000	260
554	27,400	340
556	55,100	420
557	74,000	460

Route Q_{P_1} through Reach 2

$Q_{P_2 T} = 62,470\ (1 - 436/1360) = 42,440$ cfs

$V_2 = 383$ ac-ft.

$V_A = (436 + 383)/2 = 409.5$ ac-ft.

$\therefore Q_{P_2} = 62,470\ (1 - 409.5/1360) = 43,660$ cfs

Stage = El. 555.2 or 7 ft. above top of wooden bridge and sills of ~8 cottages on right bank. Potential loss of life is more than a few.

$\therefore$ Hazard Classification is HIGH

Note:

Project discharge prior to failure is 8,000 cfs which would overtop Rte 113 by ~ 1 ft. and the d/s wooden bridge by ~ 3.5 ft.

If failure were to occur with reservoir level at elev. 675.7 (Design High Water = 100 yr flood), then $Q_{P_1} = Q_f + 210$ cfs

$= 8/27(0.4 \times 350)(32.2)^{1/2}(675.7 - 638.5)^{3/2} + 210$

$= 53,400 + 210 = 53,610$ cfs

This flow would overtop Rte 113 by ~ 6 ft. and the d/s wooden bridge by ~ 6 ft. The flow occurring prior to failure (210 cfs) would not present any prior potential hazard.

APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

END

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